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LEEDS SCHOOL OF MEDICINE

A MANUAL

OF THE

PRACTICE OF MEDICINE.

BY

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PREFACE TO THE FIRST EDITION.

My object in the present work has been to lay before my professional brethren, more particularly students and younger practitioners, a system of medicine based upon the etiology, or what I would venture to call—the natural history—of disease.

I do not, indeed, mean to imply that others have not preceded me in the same course, and with distinguished success. The profound and philosophical 'Outlines of Pathology and Practice of Medicine,' of Dr. Alison; the elaborate work on the 'Principles of Medicine,' of Dr. Williams; the eloquent as well as logical and scientific lectures of Dr. Watson; and the unfortunately as yet unfinished work of Doctors Bright and Addison, on the 'Elements of Medicine,' are more than sufficient evidence to the contrary.

Without, however, in the slightest degree, detracting from the merits of these and similar works, it is, I believe, admitted that we are at present in need of a hand-book for students.

It is hardly to be expected, and perhaps not to be desired, that a professedly elementary work should abound in originality, and therefore much that appears in the following pages must have been borrowed from others; but it cannot fail to add weight to any doctrine, which I would inculcate, to be able to enforce it by other and better authority than my own. At the same time I would add that, whatever is here advanced upon points of practice is mine, in so far as that I have compared it with my own observation and experience. I cannot, however, forbear to express my gratitude to Doctors Bright and Addison, of whom I have had the advantage of being the pupils as well as the honour of being a colleague; and to my late colleague, Dr. Babington, as well as to all my present colleagues, for much that I have acquired orally.

I am aware of many omissions, others will, no doubt, detect many errors. I trust, however, that upon questions of practice, I have advanced little that will not meet the concurrence of the enlightened members of our profession. Where, however, I have advocated opinions differing from those commonly entertained, I have stated my reasons for doing so. I fear that I have thus been occasionally led into discussions, which all must feel to be tedious, and some may reckon superfluous; but my excuse must be my anxiety, to the utmost of my ability, to connect not only practice, but diagnosis also, with principles—believing, as I do, that empirical diagnosis can lead only to empirical practice.

I hope that I may not fall short of the expectations of my friends as much as I have disappointed my own, though in regard to the latter, I would fain console myself with the words of the great moralist, that " to rest short of his own aims is incident to every one whose views are comprehensive, and whose fancy is lively; neither is any one satisfied with himself because he has done much, but because he can conceive little."

UNION STREET, SOUTHWARK,
Oct. 23, 1855.

PREFACE TO THE SECOND EDITION.

In preparing for publication the second edition of this work it has been my endeavour, as far as lay in my power, to render it worthy of the kindness with which the first has been received.

I have carefully revised the whole, re-written some parts, and added no inconsiderable amount of new matter. In doing this I have been obliged to discuss several questions concerning which there have of late arisen differences of opinion amongst medical practitioners. Of these I may mention the treatment of inflammation; and upon this most important subject I have in some degree modified the practice recommended in the former edition, though I believe the principles there adduced to have been sound.

I trust, too, that it will appear that I received the criticisms of the different periodicals in the friendly spirit in which they appear to have been offered; though upon one important subject—I mean the treatment of cholera — I have been unable to come to any conclusions other than those at which I had before arrived, or to recommend a mode of practice different from that advocated in the former edition, much as I respect the authority by which my views were called in question. I am thankful that no opportunities have occurred in this country for again testing the practice there recommended; but I may add that I speak from an experience of that dreadful disease such as can have fallen to the lot of but few, and that I have lost no opportunities afforded by a very extensive intercourse with my professional brethren of collecting the results of their experience, and thereby correcting my own.

I much regret that the work has been so long out of print; but pressing professional engagements, as well of a public as of a private nature, have rendered the delay unavoidable.

UNION STREET, SOUTHWARK,
Aug. 31, 1861.

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LEEDS SCHOOL OF MEDICINE

MANUAL
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PRELIMINARY OBSERVATIONS.

Medicine, in its present state, may be defined to be—the art of detecting and discriminating disease by the symptoms accessible to our investigations; and of removing, checking, or allaying it, by the different means, at our disposal, for influencing the vital actions of the body.

This art then presupposes a knowledge of health—that is, of the structure and functions of the body, and the forces by which it is actuated; of disease—that is, of the changes (both structural and functional) from the healthy state, to which it is liable, and of the laws which regulate the sequences of those changes; and lastly—of the action of external, and internal, agents, and remedies, upon the system, both in health and disease.

Now if the above sciences were perfect, medicine would consist of a collection of corollaries from the truths contained in them; since a knowledge of healthy structure and function would enable us at once to appreciate any departure from them; a knowledge of the changes in structure and function, which constitute disease, and of the laws which regulate the sequences, which those changes observe, would lead us to recognize its nature and origin; whilst a knowledge of the action of remedies would direct us, at once, to select and apply the most appropriate.

But as, at present, these subsidiary sciences are by no means perfect, there remains much which can be learned, only, by experience gained from the practice of medicine itself; and therefore medicine has its own truths and principles, which we cannot at present deduce from any other branch of knowledge. The *theory* of medicine must, in fact, still be regarded as an inductive *science* of itself; though we are at liberty to take for granted the established truths of those to which we have alluded, and in the following pages shall rarely enter into any examination of them. The *practice* of medicine, is an *art*, of which this science is the basis.

Physiology, or the science which treats of, the offices and functions of the different organs and tissues of the body; and anatomy, which describes their form and structure, furnish the standard of comparison whereby to estimate disease.

Thus, if there is disturbed or difficult respiration, we know that there is functional disease of the lungs or air-passages; but if, by methods to be explained hereafter, we ascertain that the lung has lost its spongy texture, and become solid, we know that there is also structural change.

Hence we perceive, that, as in the study of the healthy body there are two branches of knowledge, anatomy and physiology, of which the former is subsidiary to the latter; so also, in the study of the system under disease, we have the morbid, or pathological, anatomy, and, pathology, which bear the same relation to each other as do the two first mentioned. They are, indeed, often confounded; and this confusion leads to much practical misapprehension. Pathological anatomy treats only of form and structure, and is perhaps hardly to be called a science; whereas, pathology, or the knowledge of the laws, of structural and functional change, is, in the highest sense of the word, an inductive science; a large proportion of the materials for the induction being furnished by pathological anatomy; but, of which the general laws could no more have been inferred from pathological anatomy alone, than could the idea of digestion have been suggested by the simple contemplation of a stomach.

Disease has been described as—a deviation of the system, or any part of it, from its normal anatomical and physiological condition; but the human frame is exposed to various agencies which tend to disturb that condition, and these are termed *causes of disease*—not that we are able, in every case, to assign the cause; for this may have been too remote in its operation, or too subtle in its character to be detected by our investigations; and therefore disease is sometimes said to be of a spontaneous or *idiopathic* character, though this is but a form of confessing our ignorance of its origin.

There are, however, some generally admitted causes of disease of which we now proceed to speak.

I.

CAUSES OF DISEASE.

The term, cause of disease, is often used in too vague a sense, being sometimes employed, to express the lesion, which is supposed to give rise to the morbid phenomena,—at others, to indicate the cause, or agent, which has produced the lesion in question,—at others, again, to describe, a condition of the system, when exposed to that agent, and which has rendered it more than ordinarily susceptible of its influence. Thus, when a person presents certain symptoms which, upon further investigation, prove to be connected with inflammation of the lungs: that inflammation is often said to be the immediate cause of the disease; and if, upon inquiry, it is ascertained that these symptoms have arisen after unusual exposure to cold; that exposure is said to be the exciting cause; and, if it further appear that the patient had before been in a feeble or delicate condition, from previous illness, intemperance, or other causes, this state of system, and sometimes also the causes which may have led to it, is called the *predisposing* cause. Now, upon a little reflection, it becomes obvious that the term cause of disease. does not strictly apply to either the first or the last of these. The so-called immediate or proximate cause is, in fact, nothing but the disease itself, and therefore cannot be said to be its cause. The last again indicates merely a passive susceptibility, a thing widely different from any correct notion of an active cause. Again, to take another instance, marsh miasma or poison is well known to be the cause of ague, but persons, who have been exposed to this miasma with impunity, when in perfect health, have become powerfully affected by it, when suffering from weakness, induced by excessive fatigue, by intemperance, or by other diseases. Now these, as Dr. Abercrombie remarks,* were never known of themselves to produce ague, and therefore cannot be said to be its cause; and although such a mode of speaking is not only admissible, but convenient, in ordinary conversation; it is in the highest degree unphilosophical, and therefore inexpedient, in the language of medicine; which, though not strictly a science, is an art based upon science, and one in which the meaning of the terms employed should be fixed with logical precision.

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* On the 'Intellectual Faculties.'

We have then, the disease itself, of which the symptoms are the effect, and of which some influence or agency, external or internal, is the *true cause;* though what the real nature of the latter may be, we are not, always, able to ascertain; and lastly, we have the system, upon which, this force, or cause, acts, and of which the condition must greatly modify the result produced; and therefore, if previous disease, or other debilitating agencies, have enfeebled those powers of the system, by which—injuries are repaired,—the depressing or morbific influences of, some poisons, resisted, and others, eliminated, or—the injurious effects of too powerful impressions upon the nervous system withstood, —we shall have a great susceptibility for various forms of disease, but not what can be called a cause of such disease.

Although, however, we dissent from the propriety of calling, a susceptibility of being affected by morbific agents, a cause of disease, indiscriminately with those agents; we are, by no means, disposed to disregard such susceptibility, in any of our reasonings concerning its origin; since upon it, must, in many instances, depend, whether any disease, or none, will be induced, when an individual has been exposed to any specific, or other morbific agent; and we are also willing to admit, that this very susceptibility, is often, itself, a disease. Thus it has been stated that intemperance will render a person more susceptible of the action of marsh miasma; but this susceptibility is often associated with a structural change, in some of the depurating organs, as the liver or kidneys, if it do not consist in it, and of which intemperance is a cause: and, we know also, that such structural change does often constitute, in itself, most formidable disease.

The predisposing conditions which constitute a liability to disease, upon the application of its ordinary causes, are chiefly as follows:—

(1.) An hereditary tendency to particular diseases, transmitted from parent to children.—It is true, indeed, that all constitutional peculiarities in the parents, influence their offspring, in a greater or less degree; but this is more particularly the case, with certain diseases, amongst which are scrofula and tuberculosis, in all their varieties,—cancerous disease,—asthma, —diseases of the nervous system, especially epilepsy and mania,—gout,—gravel,—diabetes,—and several diseases of the skin.

Now it is obvious that this congenital liability to particular diseases cannot be removed by art; but if we also know, and can, by any means, obviate, the immediate agents which are the causes of these diseases, we may often, do much, towards their ultimate prevention.

(2.) But besides the above, which may be said to be *inherent* liabilities, there are others, arising from, what may be called, the accidents of the individual: such are casual occurrences, in the form of disease, or otherwise, which, by impairing the power, of the circulation, or depressing the nervous energy, render the system more susceptible of any morbific influence to which it may be subjected. Amongst these may be reckoned, imperfect, unwholesome, diet, especially during the period of infancy and youth; —the habitual want of the natural stimuli, muscular exercise, fresh air, and light;—previous debilitating diseases, and excessive and repeated evacuations, either of the blood or of the serous part of it;—habitual intemperance, which produces chronic change in the organs of circulation, digestion, and secretion, besides depressing the nervous energy:—these, like hereditary predisposition, impress upon the system a susceptibility, which is, more or less, permanent and constitutional. (Age and sex have also their peculiar tendencies to disease.)

(3.) The same causes, when acting only for a short time, may produce a temporary and transient proclivity to disease. So also may long-continued exposure to cold, depressing passions, excessive exertions, privation of sleep, protracted fasting; also exposure to excessive and long-continued heat, to impure air, as that of crowded or ill-ventilated rooms, or emanations arising from imperfect drainage: though each of these may often prove a direct cause of disease; as may also, intemperance, and vicious indulgence.

Of the above agents, some affect, more powerfully, particular organs, and dispose them more than others to suffer from the application of any cause of disease; but, as Dr. Alison very justly observes, "there is no one organ, or texture, which is uniformly affected, nor any one kind of diseased action which is uniformly excited by these causes." Their general effect, is, to dispose the body to suffer from the exciting causes of inflammations, or other acute diseases,—amongst which latter we may include the various morbific poisons which affect either particular individuals, or whole communities.

We are thus led to a threefold division of the causes of disease; into, 1st, *Sporadic*, or those affecting particular individuals; 2nd, *Endemic*, that is to say, continually, or at repeated intervals affecting the inhabitants of a certain fixed locality; 3rd, *Epidemic*, powerfully, and often fatally, affecting, for a time, the population of certain districts or countries, and disappearing from them, to reappear again in other districts, or in the same district at some future period.

Of sporadic diseases the chief causes are,—

1. Mechanical and chemical injury; which, however, fall mostly within the province of the surgeon.

2. Violent muscular exertions, hurrying the movements of the blood; and thus, by disordering the circulation, favouring local congestions, and, sometimes, injuring some portion of the circulatory apparatus.

3. Mental emotions, and intense sensations; which sometimes disturb the action of the heart, or the circulation through the brain, and at others derange the secretions.

4. Excesses of all kinds, which injure the secretions, and induce chronic diseases of the secretory organs; and, by disordering the circulation, produce disease of the vascular system.

5. Suppressed evacuations, which induce plethora in any part of the system that may be predisposed to it: whilst excessive evacuations, by weakening the action of the heart, will sometimes produce the same result, and sometimes greatly derange the functions of the nervous and vascular system.

6. External heat; which may either irritate the part exposed to it, indirectly affect the nervous system, or disorder the general circulation.

7. External cold—which often powerfully affects the nervous system, and greatly deranges the circulation, producing active congestions and inflammations; and, by repressing the action of the skin, induces disease of those secretory organs to which the former is auxiliary—is one of the most frequent, perhaps the most frequent, of all the causes of disease.

The effect of cold upon the part to which it is immediately applied, is rather to render it susceptible of, diseased action, than directly to excite it; this action evidently arising when the temperature is subsequently restored. It appears also, that the effect of heat or cold in producing intense sensation, or disturbance of the healthy action, is proportionate, not so much to the actual temperature, as to the rapidity with which change of temperature is induced. Thus, the application, of the natural temperature of the body, to a frost-bitten limb, will produce the same effect as a heat of 212° F. under ordinary circumstances; and the effect of cold in producing internal disease is increased by previously heating the body; and for a similar reason, it is greater when applied by drafts or currents of air, or by wet clothes (and the subsequent evaporation from them), which rapidly carry off the heat of the body. Though, as Dr. Alison adds, "in the circumstance of moisture, and, perhaps, other occasional qualities of cold air, there seems to be a peculiarity not yet understood, as to the power of exciting inflammation."

A languid state of the circulation, and the consequent diminished power of generating heat, increase and prolong the sensation of cold applied to the surface; and so favour its action in producing internal congestions: and it is probably, on this account, that during sleep the system is much more prone, than at other times, to suffer from the influence of cold.

The effect of cold, in producing internal inflammations, is very remarkable, when it is applied to parts, largely supplied with sentient nerves, and which are ordinarily protected, by warm covering or otherwise; especially when compared with its effects upon other parts, similarly supplied with nerves, but not similarly protected: thus the sensation, produced by cold applied to the feet of those who are commonly warmly shod, is most intense, and apt to produce internal congestions; although the same individual may expose his hand to great cold without any ill effect, or even inconvenience—a circumstance which seems to imply that the nervous system plays an active part in the production of these results. Another illustration, of the effect of cold acting through the agency of the nervous system, is seen, in the almost sudden death which has sometimes ensued upon drinking large draughts of cold water, when the system has been much heated and exhausted by previous exertion; in such cases it is probable that the heart has been stopped by the shock produced by the sudden impression upon the nerves of the stomach, much as a pugilist has been sometimes felled by a blow over the same organ.

Cold liquids, taken internally, have also been known to produce an injurious effect, in a less sudden manner, by checking the action of the skin, and, probably, that of the kidneys also, and so inducing dropsy. Of this, an instance is recorded by De Haen, who mentions that the greater part of the army of Charles V., in his expedition against Tunis, were attacked with dropsy, in consequence of the soldiers having freely quenched their thirst with cold water, when under great fatigue and perspiration.

The depressing effects of cold may be resisted, or greatly mitigated, by a vigorous state of the circulation, which quickly restores the heat that is lost; and, by that tone, or power of endurance, in the nervous system, which we can best describe, by characterizing it as opposite to that which is induced by, a too careful, exclusion of cold, and application of artificial warmth. This vigorous state, of the vascular and nervous systems, is promoted by habitual exercise, the occasional prudent application of cold, and by a moderate nourishing diet.

There are causes of disease which act on large numbers, and with great violence at certain times, and in certain places only, (generally by the slow introduction of a poison by the *primæ viæ*, or in some cases by the lungs), but which can hardly be said to be endemic. Of these we have instances,—

in scurvy, which attacks, whole ships' companies, and, it may be, bodies of men on shore, when restricted to the use of salt provisions, and deprived of succulent vegetables,—in the palsy from lead, not only affecting painters, plumbers, and other workmen, but also large portions of the community, when using water, slightly impregnated with the salts of that mineral, derived from leaden pipes or cisterns. Another instance is to be found in the pallid, doughy cachexia, so common in large towns, which is to be referred, in great measure, to the effluvia continually emanating from drains, cesspools, graveyards, and other sources of impurity abounding in such places; and which, probably, enters the system through the lungs; though, no doubt, the want of radiant solar light greatly enhances the effect of such exhalations. After all, however, these are but cases of slow poisoning.

Again we have causes of diseases, which are, in the strictest sense, endemic (εν δημῶ), that is to say, affecting only the population of particular districts, and that without any great variation as to particular seasons. Of this class of causes of disease are, the bronchocele, affecting the population of parts of Switzerland and Derbyshire; the cretinism of the Alps; the elephantiasis of Egypt.

There is another class of causes of disease of great importance, at times extensively and fatally prevalent, affecting for a season, the population of certain districts; the disease thus produced being of a definite character, and one, which may with tolerable certainty be ascribed to a specific poison.

Such diseases are said to prevail epidemically (επι δημῶ), from their coming, for a time, *upon the people* of a certain country or district, which is at other times perfectly free from them.

The *causes* of some of them are, however, in one sense of the word, strictly endemic, that is to say, arising from the circumstances of the locality, so that although disease may only prevail at certain times in a particular districts; yet it is liable to recur epidemically in that district, and cannot affect other districts indiscriminately, but only such as resemble it. Of this form of epidemic disease, we have an instance in the agues which, at certain seasons, prevail in marshy districts, the cause of the disease being in such cases endemic,. and consisting in a miasma produced by the emanations from decaying vegetable matter.

Other diseases, again, affect whole populations with great rapidity, continuing their influence for a limited time, and attacking, in rapid succession, different districts, between which there can be discerned no points of resemblance that can be assigned as causes of the disease; their outbreak in any locality not being to be accounted for by communication with persons from infected districts. Of this form of epidemic cause of disease, the influenzas which have prevailed, at different times, without regard to place or season, afford a good illustration.

Other diseases again prevail epidemically, but which may be clearly traced to communication with infected persons; though there can be little doubt that in the majority of instances, their diffusion is promoted by some circumstance affecting the population generally. Such diseases are contagious. Though by the term contagion we do not imply exclusively immediate contact by touch, but also mediate communication, as by means of the clothes,—the excretions—the breath, or other exhalations.

II.

MODES OF DEATH FROM DISEASE, AND OF ITS FAVOURABLE TERMINATION.

THERE are few more important considerations, in the treatment of diseases, which threaten life, than that of the manner of their fatal termination, when they end in death. The different modes of dying were first explained by Bichat, in his celebrated '*Recherches sur la Vie et la Mort;*' but the subject was first treated of, in reference to disease, by Dr. Alison, of Edinburgh, and has since been elaborated, with much perspicuity and elegance, by Dr. Watson, in his beautiful lectures. A few short and simple reflections will, however, be sufficient for our present purpose.

The different modes in which life ceases are through the arrest of the two primary vital functions,—circulation and respiration. Of these, the former cannot be suspended, in the human subject, for more than a few seconds, and the latter, for more than three minutes, without life being extinguished.

We perceive, then, that there are two simple modes of dying: I. Death from failure of the heart's action, or, to speak more comprehensively, death, from failure of the moving powers of the circulation, which is technically termed *syncope;* II. Death from impediment to the aeration of the blood in the lungs, or death from *apnœa.*

I. Death from syncope, or *death from the heart,* may be produced (1,) From a sudden shock to the nervous system stopping the heart's action; or the same effect may be produced by weakness of the organ itself. The anatomical characters, of this form of death by syncope, are, full cavities of the heart, with the dark blood on the right side, and the crimson arterial blood on the left. (2.) By sudden or gradual abstraction of the blood—the natural stimulus of the heart,—as in the case of violent hæmorrhage, or of its drain by slower abstraction. Cases too, occasionally occur, which render it probable, that death, from failure of the heart's action, may be induced by arrest of the extreme circulation, cutting off from that organ its supply of blood: this may be termed *peripheral syncope.* The anatomical characters of this mode of death are, in extreme and rapid cases, empty ventricles, pretty firmly contracted; and, in cases where death has taken place more gradually, flaccid, but not empty ventricles.

II. The second mode of death may ensue, (1,) when injury, to the nervous system, paralyzes the movements of respiration, causing what is termed, death by coma, or death beginning at the brain; and (2,) by obstruction to the circulation through the lungs, constituting what is more strictly termed death by asphyxia, or death by apnœa. The anatomical characters of death from obstructed pulmonic circulation, are full cavities of the heart, those on the right side being more particularly so; and in the latter, the blood is of a very dark colour, whilst, in those on the left side, it is of an almost venous hue.

It is into these two modes of arrest of the vital functions, that all the different forms of death arising from injury or disease, ultimately resolve themselves; although the manner of death, in many, or in most, may not be entirely simple; so that each of the causes of death may be more or less in operation. It will, however, almost always be found that one or other predominates.

I. Death from syncope, produced by a sudden shock, may be caused, though rarely, by injuries inflicted upon the substance of the nervous centres. It has been found, that the integrity, or even existence, of these organs, is not essential to the functions of organic life, which may be continued when the brain or spinal marrow has been gradually removed or destroyed: but, if a violent injury is suddenly inflicted, upon the cervical portion of the spinal marrow, or, upon the medulla oblongata, immediate death by syncope is the result. It is also, through the influence of the nervous system, that mental emotion, as the sudden announcement of distressing intelligence, has sometimes proved fatal. In the same way, a shock may be carried from the extremities of the incident nerves to the nervous centres, and be reflected to the heart; by violent and extensive injuries, especially those which involve an extent of surface largely supplied with sentient extremities of nerves: and the same thing occurs, from wounds or other injuries of the abdomen, as well as from spontaneous disease of great intensity, occurring in that region, particularly near the situation of the solar plexus; the depression of the heart's action being, in the case of disease, less sudden, and the fatal syncope, when it does take place, coming on more gradually, than in the case of injury.

Death from the heart, may also take place, from weakness of the organ itself, when its walls have become attenuated, or otherwise weakened, by disease, or its ventricles dilated to an extent greatly disproportionate to their thickness: or, a sudden stress may be thrown upon one of them (the left ventricle most commonly), as happens sometimes when there is laceration of the sigmoid valves.

It is probably through the impression produced upon the extremities of the nerves, that certain poisonous substances, as the ourari or upas-tree poison, produce death by stoppage of the action of the heart.

The heart's action may also fail, with greater or less rapidity, from the abstraction of its natural stimulus, the blood; as happens in violent hæmorrhages: and, more gradually, in wasting discharges—in diseases of the organs of digestion, impairing nutrition—and in death from starvation.

Fatal syncope therefore includes the most sudden deaths, such as occur when the life is extinguished by—violent concussion of the brain,—sudden extravasation of blood in the medulla oblongata,—sudden crushing of the medulla spinalis, from violence or from sudden dislocation, consequent upon disease of the ligaments of any of the cervical vertebræ, those especially of the atlas and dentata—death, also, from disease of the heart is well known to be amongst its most sudden forms, and, in such cases, it is by syncope. Death from failure of the heart's action is not, however, *necessarily* sudden; for though violent hæmorrhage may produce very speedy death, the death, in most cases, even of severe hæmorrhage, is more gradual, and is preceded by pallor, clammy sweats, irregular pulse, and insensibility; with these symptoms are frequently conjoined others more directly referable to the nervous system arising from the diminished supply of blood to the brain: amongst these are, nausea, or vomiting, restlessness, and jactitation, with transient delirium, irregular sighing respiration, gasping, and convulsions.

Certain poisons, of which we have specified that of the upas-tree, appear to produce sudden failure of the heart's action, that organ being found full, but, as it were, unable to contract upon its contents; but, on the other hand, we have an instance, in sudden death from digitalis, of the ventricles being found contracted and empty, which certainly seems to favour the notion of the blood being delayed in the extreme circulation, rather than of a loss of power in the heart to propel it. This is an instance of peripheral syncope.

Death from failure of the heart's action may take place still more gradually, and it is then strictly termed death from *asthenia:* of this, the most perfect instance occurs, in fatal inanition or starvation, which leaves both ventricles flaccid, but, as nearly empty, as after death from rapid hæmorrhage. The same thing happens when death supervenes upon diseases impeding, digestion and nutrition, or absorption, and which obstruct the renewal of the blood, as it is expended to supply the waste of tissues: this kind of death may also be brought about by exhausting discharges, or extensive suppuration.

II. Death from obstructed respiration may, as already pointed out, be twofold—(1) death from apnœa, properly so called; and (2) death from coma.

(1.) The first of these takes place when an animal is killed,—by the exclusion of air from the chest,—by restraining the movements by which the respiration is carried on,—or by obstructing the passage of the blood through the lungs, from impediment to the circulation through the heart. Of the above we have instances, in drowning, strangling, suffocation, or violent pressure upon the walls of the chest and abdomen, stopping both the expansion of the chest and the descent of the diaphragm;—also, in disease, when these movements are stopped by paralysis, which occurrence belongs more commonly to the next form, or death by coma, but which may occur without the stupor which characterizes the latter. This form of death may also ensue when a sufficient supply of oxygen is prevented by the inhalation of other gases, such as hydrogen; which, though not poisonous, cannot support respiration. It may be caused, in disease, by closure of the larynx or trachea; and, by those affections, whether of the bronchial tubes or lungs, which prevent the free access, either of the air to the air-cells, or of the blood to the vessels which ramify between and around them; as well as by those which exclude both air and blood from the lungs, as is the case with large effusions of serum into, the substance of the lungs, or the pleural cavities. It may be produced, also, by stagnation, or stoppage of, the blood in the lungs by disease of the left side of the heart.

The anatomical characters of this mode of death are, a very great engorgement of the cavities on the right side of the heart, and the presence of venous blood in those of the left. The right side, it should be observed, is always the most distended of the two, the left being, in some instances, comparatively empty; and that too in cases where there would appear to have been no *mechanical obstruction to the pulmonic circulation*; showing that, by a want of the access of oxygen, a congestion takes place in the capillaries of the lungs; even though the respiratory movements and expansion of those organs may be unopposed.

(2.) Death from coma, or death from the brain, is, in its ultimate result, the same as death from apnœa; but there is this difference; that, in the former case, aëration of blood in the lungs is impeded, by loss of irritability, in that part of the nervous system whence the nerves of respiration have their origin. The anatomical characters, therefore, as regards the lungs and heart are the same, the lungs being congested, the right side of the heart gorged with black blood, and the left side circulating venous blood. It is, in this way, that effusion of blood or serum into, the substance, or the ventricles, of the brain, or upon its surface, causes death; and that many poisons, whether taken into the system from without or generated within it, induce the same result. Of the poisons, the true narcotic ones produce death in this manner, and such poisons act more slowly than some which produce death by syncope, from a shock, as it were, or sudden impression upon the nerves. Morbid poisons, among which may also be classed excrementitious substances, such as bile and urea, produce death generally by coma, that is to say, by acting as poisons on the brain; but they may also, especially the latter, when in great quantities, act as direct sedatives to the heart.

As regards the action of poisons, there has been a good deal of difference amongst physiologists, and a great many experiments, apparently contradictory, have been performed, mainly with a view of determining the question—whether poisons, by, being taken into the circulation, and conveyed to the brain, destroy life by extinguishing sensibility, in which case the mode of death ought necessarily to be coma;—or whether they operate, before they reach the nervous centres, upon the sentient extremities of the extreme nerves. Now, as we have seen that the modes, of sudden or speedy death, may be various, according as it takes place from the heart, the lungs, or the brain; so it is but reasonable to expect that the modes of death from poisons may be so likewise; and, that, as violent injuries will sometimes produce death, by syncope, from a shock to the system, or violent impression upon the extreme nerves; so some very powerful poisons will act in the same way, and that,—obviously—without any need of their being taken up into the general circulation: whereas others, amongst which are poisonous gases, may obstruct the circulation through the lungs, and produce death from apnœa; whilst others again, like the narcotic poisons, produce death by coma, and must, therefore, in the generality of instances, act only after they have been absorbed. But further than this,—these poisons, several of them at least, act differently according as the dose is great or small, and according to the susceptibilities of the individual. Thus some poisons, as opium or alcohol, which will, in certain doses, produce coma after excitement, will, in larger ones, produce instant death; either arresting the moving forces of the circulation by the powerful impression upon the nerves of the stomach, or producing immediate coma without excitement. We need, then, be at no loss to account for the different results, as regards the time and manner of death, recorded by different observers when experimenting with different poisons.

The necessary inference, however, appears to be, that as different injuries will produce death in different ways, by acting either upon the heart or the nervous system; and that as the same difference may be observed in regard to injuries similar in kind but differing in intensity; so different poisons may act either upon the nervous centres after absorption, or more directly upon the moving powers of the circulation by the impression produced upon the sentient extremities of the nerves; and that the same difference may be observed in the mode of death from the same poison, according to the amount of the dose, and the manner of application.

It has just been stated that it is, to one, or other, of these modes of death that the fatal termination of disease may be attributed. There will not, however, necessarily be the tendency to the same mode of death throughout the progress of every disease; and this is especially the case in inflammatory affections. In such diseases (in internal parts) we have, from the nature of the case, two distinct causes in operation, either of which may become dangerous to life; first, the inflammation itself, which, sometimes by its intensity produces, the same effect as severe and extensive mechanical injury, and causes death by rapid syncope; but at others, the same result, by mere gradual sinking from the exhaustion consequent upon continued febrile excitement. Secondly, besides the inflammation itself, we have the disturbance or even suppression of the function of the part, (the *læsa partis functio* of Cullen,) which may of itself give rise to syncope, coma, or apnœa, according to the organ affected.

Thus, in acute disease of the brain we may have (though rarely) rapid syncope, as in the case of violent injury to that organ; or again, there may be gradual sinking, or death from asthenia, through exhaustion consequent upon excitement; or lastly, there may be death from coma, through the suspension of its functions, caused by the injury done to the organ itself. In affections of the lung there may be gradual syncope, consequent upon the febrile state induced by disease: or there may be death from apnœa as the result of the *læsa partis functio*.

In affections of the liver and kidneys there may be the direct effect of acute disease as noted above, but very often a peculiar mode of termination is observed, the local disease causing, retention of the natural secretion, which influences the system as a narcotic poison: and it is almost certain, that death from many febrile diseases, especially those which are termed specific, is often owing, in great measure, and sometimes wholly, to the influence of causes which affect solely the fluids of the body, or its innervation, without altering the structure of any of its solid parts.

The tendency of a large proportion of diseases, both acute and chronic, to a spontaneous favourable termination, is a matter of equal practical importance, and perhaps of more than equal obscurity, to their modes of fatal termination. This general tendency, and the difficulty of its explanation, are, at once, attested by, the invention of the doctrine of, a *vis medicatrix naturæ* resident in the system :—a theory in itself objectionable, since it implies a substitution of the final, for the physical and proximate, cause of the general fact, which is affirmed by the existence of the term.

Some general and well-established principles may, however, be adduced as an explanation of the general tendency of disease to a spontaneous subsidence.

Many of the external causes of disease are naturally transient, and the diseased action, which they excite, subsides soon after their discontinuance. This is especially the case, with disturbing causes affecting, the circulation, and the functions of the nervous system; such, for instance, as—violent muscular exertion—mental emotion,—or the agency of heat and cold, provided they be not sustained sufficiently long, to produce organic disease, or intense inflammation. The same is true with regard to the effects of, impure air and want of light, arising from the defective drainage and improper construction of, dwellings, and workshops; causes of disease, which, by the adoption of wise sanitary regulations, might be rendered practically transient in their operation; but the effects of whose continued agency is but too obvious in a large proportion of the population.

The substances, again, ordinarily called poisons, obtained from the vegetable, and animal, as well as the mineral, kingdom, if not taken in excessive quantity, are either decomposed in the system or expelled with the different excretions. In a number of cases where the causes of disease have been applied, as, for instance, in the form of those agents which excite ordinary inflammation, or by the introduction of the strictly morbific poisons into the system, the diseased action, though it continues after the causes are withdrawn, is nevertheless in its nature temporary, and subsequently subsides.

This spontaneous recovery is to be included in, what we must regard as, an ultimate fact, since it cannot as yet be ascribed to any more general law, namely :—that all vital action is but of limited duration, in any part in which it resides; and that a general law of intermittence of action, or alternation of activity with repose, applies to all the changes going on in the healthy state of muscles and nerves, as well as in the diseased actions peculiar to these parts, and therefore we cannot be surprised to find that other and more obscure morbid actions should be subject to the same law.*

In many instances of local injury, inflicted by diseased action, in different parts of the body, we can recognize the means, by which, nature repairs the injury, or obviates its effects. Thus the absorption of the characteristic effusions of inflammation, and the disintegration of its solid products into puriform matter, or molecular lymph, which may be discharged from the system, are instances of the former; whilst in the deposition of fibrinous lymph by which hæmorrhages are stopped and other extravasations (such, for instance, as arise from perforating ulcer of the intestines) prevented, and even in the removal, by sloughing, of mortified parts, we recognize contrivances by which the worst effects of injuries, which do not admit of perfect repair, may be obviated. Further instances of this may be seen, in the obstruction of the circulation through diseased parts, and the more active vascular action in neighbouring ones, together with the consequent increased development of the latter, by which the function of the injured organ is maintained; and the same may be said of the hypertrophy of muscular strictures, especially the heart, arising from obstructions to their natural actions, whereby the otherwise fatal results of such obstructions are prevented or delayed; although, this very hypertrophy often becomes, itself a serious inconvenience, sometimes a fatal disease.

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* Alison's 'Outlines of Pathology and Practice,' p. 44.

III.

ELEMENTARY CHANGES.

Certain changes or deviations from the healthy state may take place in the proper elements of a part; these, although they may not be appreciable as disease, or become special objects of treatment, are nevertheless of importance, as constituting the first steps, towards those conditions which we, more certainly, recognize as such.

Irritability, or the capability of, contracting upon the application of a stimulus, is the distinctive property of muscular fibre, and may be regarded as one of the simplest manifestations of vitality in the living body.

This irritability may become excessive: producing, 1, undue strength, or violence, of muscular contraction; 2, over-readiness to contract, or susceptibility of being excited by too slight a stimulus; 3, unusual persistence of contraction, constituting tonic spasm or cramp.

Irritability may be defective: 1, from a deficiency of strength of muscular contraction; 2, from a slowness, or sluggishness, of contraction, under the ordinary or appropriate stimulus.

Tonicity, or the tendency to slow moderate contraction, not necessarily terminating in relaxation, is a property not only manifested by the obviously muscular structures, but also by some others not generally accounted such; as, the air-tubes, and the middle coat of the arteries, giving them a tendency to contract upon their contents. In many respects tonicity appears to be closely allied to irritability, and it is, in the main, excited by the same agents; but, with this remarkable exception, that cold increases tonicity and impairs irritability, whilst heat, which diminishes tonicity, although it relaxes the muscles, renders them, at the same time, more irritable.

Tonicity may be excessive: when this is the case the muscles are disposed to be rigid; and the pulse is hard, owing to the contraction of the cavities of the heart being, vigorous, and the contractile, or resisting, power of the artery, considerable: the capillary circulation, also, is active, and the secretions are scanty, especially that of the skin, which is dry and hot.

Tonicity may be defective:—when this is the case the muscles are lax and flabby, though their irritability may be in excess; there is tremulousness, and the heart's action is feeble though irritable; the arteries, owing to their diminished tonicity, yield readily to the injecting force of the left ventricle, and the pulse, though soft, is generally full. The extreme circulation is feeble; the secretions are irregular; being either deficient, through the languid circulation in the secreting organ, or profuse and watery, owing to the relaxed condition of the vessels.

Another element of disease in the dynamical condition of a part, appears to be an alteration in the relation between the tissues and the blood. That some such change is likely to take place, may be inferred from the analogy of health; since, it is the condition of the part, rather than that of the artery supplying it, which determines, the amount of blood which it receives, as well as the activity of the circulation through it; although the conditions upon which this mutual relation depends, are not sufficiently understood, to enable us to explain its alterations; and we must therefore regard these alterations as ultimate facts.

Disturbances of the nervous influence of a part, or as they are termed by Andral, lesions of innervation, constitute another primary element of disease. It is true indeed, that in the greater number of such instances, the alterations, of nervous force, originate in changes in, the brain or spinal cord, or large nervous trunks; yet, in these cases the disturbance thus produced, may set up fresh morbid action in the parts to which the ultimate filaments of the nerves are distributed: but further than this,—there is reason for believing that besides being propagated to them, morbid changes may commence or be excited in the nervous fibrils themselves, and produce in their turn, alterations in the circulation and nutrition in the nervous centres.

The blood, again, may undergo changes in its physical, chemical, and vital properties; and these changes constitute another class of the primary elements of disease.

Among the most important of these changes, are the alterations in the proportions of its ingredients.

The red corpuscles of the blood may exceed the healthy standard in quantity; a circumstance which is generally observed in a state of the system, commonly described as plethora. The proportion of these corpuscles, in health, is from 120 to 130 per 1000; but in this condition, they are found to amount to as much as 135 to 160 per 1000. The blood in such cases is remarkable for its deep colour; the clot is large and of a very moderate firmness, and is never buffed, owing to the small relative proportion which the fibrine bears to the corpuscles; the serum also remains more or less coloured, after the coagulation has been completed.

It is not improbable that in some cases of general plethora not only is the blood, abnormally abundant in red corpuscles, but it is also excessive in quantity throughout the system;

though it may be a difficulty to say, whether, such be really the case or, whether, the mere superabundance of red corpuscles, by making the presence of the blood, more apparent on the surface, and in the different textures, may suggest the belief that such is the case. This state of system, which appears to be an idiopathic affection in some persons, is, in most, induced by sedentary habits and full living. Such persons have turgid, injected cheeks and red mucous surfaces: when attacked with acute disease they require more depletory measures than others, and bear them better.

This condition is best remedied by moderate diet, active exercise, and saline aperients.

The red corpuscles may, on the other hand, be defective in quantity: this occurs in the state generally known by the term anæmia (want of blood, α privative and ἁιμα), a word for which it has been proposed to substitute spanæmia (poverty of blood. σπανος and ἁιμα) as more strictly expressing the real condition of the fluid. In this state, the red particles only are affected, the fibrine and solid contents of the serum retaining their normal proportions; thus, in the earlier period of spontaneous anæmia, and in its milder forms, we find the quantity of red corpuscles to be about 100 per 1000, and in the more advanced or severer cases, as low as 65 or even 30. The physical properties of the blood are in accordance with what might be expected from the deficiency of the corpuscles. After it has been allowed to flow freely, and left to coagulate, we find a small clot floating in an abundant colourless serum; the clot is remarkably firm, and it is by no means uncommon to find it covered by a distinct buffy coat, produced, as we shall hereafter have occasion to explain, by the excess of fibrine relatively to the corpuscles; the effect being the same, whether this excess arises from the increase of the former, or the diminution of the latter.

General anæmia may, like general plethora, occur as a primary affection, though it is more commonly the effect of visceral disease. Females are more liable to it than males, and, as a primary affection, it is most frequent at, and for a few years after, puberty. It is, in some instances, due to inherent weakness of constitution, and is induced by innutritious diet, confinement in close, ill-ventilated rooms, want of exercise in the pure air of the country, and want of solar light; most, or all, of which conditions, concur in producing it, in the pale-cheeked and white-lipped young women, employed in many London workrooms: the agency of mercury and lead upon the system also promote it: it is the direct result of, large, sanguineous, or other discharges, and is, as has been noticed, the effect of disease of internal organs, those especially which are concerned in making, elaborating, or purifying the blood; such as the alimentary canal and its appendages, the lungs, the liver, the spleen, and the kidneys; it should, however, be distinguished from the leucocythæmia, to be presently noticed.

It is best counteracted by obviating, as far as possible, the circumstances known to promote it—by good, nutritious diet, exercise in the open air of the country, and by the use of chalybeate medicines.

Besides variation in quantity, the red particles are liable to structural change, in disease. Thus, in scurvy and Walcheren fever, the blood has been described to be of a pitchy blackness, arising, no doubt, from change in the colouring matter of the corpuscles. There may also be a breaking up of these corpuscles, and solution of the colouring matter, shown by its staining, not only the blood-vessels, but some of the surrounding textures, into which, the entire corpuscles could not have transuded. They also undergo alterations in form and size, which, however, most probably arise from alterations of the liquor sanguinis, or medium in which they are suspended. It was observed by Hewson, that pure water caused them to swell, whilst they shrunk in strong saline solutions; changes which are now generally understood to be brought about by endosmosis and exosmosis, with the surrounding medium, causing fluid to pass in or out of the cell, according as it is of less or greater density than the fluid which the cell contains, which fluid must, in health, necessarily be of the same density as the serum. The red particles may also, under disease, lose their capability of changing from the venous to the arterial hue by the action of oxygen.

The white corpuscles, which are larger than the red, are in health far less numerous. In a peculiar form of disease, however, they become almost as much, or even more so. The latter are, however, under such circumstances, fewer than in health. This obscure affection has obtained the name of *leucocythæmia*, and is generally associated with great prostration, a tendency to spontaneous discharges of blood, and with enlargement of the spleen.

Alterations in the fibrine occur both as to its quantity and its physical and vital properties. The mean proportion of fibrine in the blood is, according to Andral, 3 per 1000, though other observers have estimated it somewhat lower. The proportionate quantity of this principle undergoes extensive changes in disease. Increase in the quantity of fibrine is termed hyperinosis; this occurs particularly in inflammatory diseases when its proportion amounts to as much as 6, or even 8 per 1000. In some diseases of debility, as for instance, low typhoid fever, it may be reduced as low as to one and a half, or one, per thousand.

Besides these changes in the quantity there are others still more important in the qualities, of the fibrine. Of these the most remarkable is its property, of passing from the fluid to the more solid form, by which the coagulation of the blood is produced: and the changes which occur in this process of coagulation in connection with diseased action are among the most interesting of morbid phenomena. "Within a few moments after emission, the blood, in the natural state, divides itself into a yellowish fluid called serum, and a dark red spongy mass called crassamentum.* The time occupied by the separation of the clot, as well as the appearance which it presents when formed, differs in different conditions of the system. The time may vary from 1½ minute to 15 or even more, though the causes inducing this acceleration and retardation have not been very clearly ascertained. The coagulation appears to be hastened by the action of the atmosphere, and it may be greatly retarded by its exclusion, as when blood is drawn into a vessel of oil.† Again, it is well known that the artificial addition of many salts to the blood retards its coagulation, hence we may conclude that a slow coagulation may depend upon an increase of the salts of the blood. It is also retarded by the contact of an animal membrane, and the fresher the membrane the longer is the retardation. Blood or even liquor sanguinis, which is withdrawn from the pale of the circulation, as when included between ligatures in a vein or an artery, remains a long time uncoagulated, and the retardation is greater in an artery than a vein. Liquor sanguinis effused into any of the cavities of the body will remain uncoagulated, for many hours after death, but when removed from the body will coagulate in a few minutes. Dr. Richardson,‡ in the Astley Cooper's prize essay upon the coagulation of the blood, has endeavoured to explain the coagulation or fibrillation of the fibrine by the escape of ammonia from the blood after it is withdrawn from the body, the ammonia being, as he says, the solvent of the fibrine when in circulation. The arguments and experiments, by which he has supported this opinion, are of considerable weight; and though this doctrine has been controverted by several distinguished physiologists, amongst others, by Mr. Lister of Edinburgh, there can be little doubt, that, ammonia plays an important part in the phenomena of the solution and coagulation of the fibrine.

Independently, however, of these considerations, the time occupied by the coagulation appears to be influenced by the quantity of the fibrine; for, if the amount of this principle be larger than ordinary, the time, which elapses before the coagulation, is increased; and the coagulum possesses an unusual degree of firmness: and in general, when the fibrine is abundant the clot is firm, and the coagulation slow; and, when the fibrine is scanty, the clot is loose and the coagulation speedy; as is the case with the last portion of the blood which flows when an animal is bled to death.*

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* Alison's 'Outlines of Pathology.'

† Dr. Babington in Med. Chir. Trans., vol. xvi.

‡ 'The Cause of the Coagulation of the Blood,' by B. W. Richardson, M.D. London, 1858.

It is to be remembered also, that the corpuscles of the blood are of greater specific gravity than its other ingredients; and consequently these bodies must, when the blood is at rest, have a tendency to sink towards the bottom of the vessel. This tendency is, in a great measure, counteracted, in healthy blood, by the corpuscles becoming entangled in the meshes of the fibrillating fibrine forming the clot; and, even then, its lower portion is of a deeper colour than the upper. If, however, it happen that the blood is longer in coagulating, or the corpuscles subside more rapidly than in the healthy state, we shall have the upper part of the clot free from corpuscles or nearly so, to a greater or less depth, and forming what is commonly known as, the buffy coat. This network of fibrine, free from red particles, frequently continues, subsequently to its coagulation, to undergo a slow contraction; by which, the edges of the clot are drawn towards each other, giving its upper surface the concave appearance commonly denominated "cupped."

To sum up what has been said, the formation of the buffy coat is promoted, 1st, by an increase in the proportion borne by the fibrine to the red particles, whether that increase depend upon an excess of the former, or a defect of the latter; 2, by the time occupied in the coagulation of the blood, which time is increased by an increase in the salts of the blood and by an increase in the quantity of the fibrine; 3, by the rapidity with which the red particles subside through the coagulating liquid, which may be increased by a diminution of the specific gravity of the serum, and also by an arrangement which they seem under some circumstances to affect, viz., a coalescence in considerable numbers, having their flattened discs apposed to each other, like rouleaus of coin, which force their way through the semiviscid fluid by their aggregate weight more quickly than they could do singly; 4, by an excess of ammonia in the blood, or by its slow elimination.

The size of the clot is in the inverse proportion to its firmness, and in the direct proportion to the quantity of fibrine; so that, when the clot is loose, it may be apparently large; although the quantity of fibrine may not be great: a large and firm clot, however, indicates a large proportion of fibrine, and a great amount of fibrillating or contractile force, and when this force is in excess, depending probably upon increased tonicity, the continued contraction, of the fibrine forming the buffy coat, gives it the cupped appearance.

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* Carpenter's 'Manual of Physiology.'

An important practical inference may be drawn from the above statements, viz.,—that the buffy coat is not of itself a certain sign of any particular condition of the blood, since it may be produced by several different, and, in some respects, opposite causes.

The proportion of dry albumen in healthy blood is about 70 or 80 per 1000 ; under some circumstances of disease, probably in inflammatory fever, it may be increased ; and the same may happen (proportionately to the fluid constituents of the blood) when a large quantity of water is carried rapidly out of the system, as in spasmodic cholera. This principle is reduced in quantity sometimes as low as 60 or 50 per 1000, or even lower, when a considerable amount is carried off, by the urine in disease of the kidneys, or by repeated hæmorrhages, or other exhausting discharges. It is possible that it is also deficient in cases of imperfect digestion or sanguification.

The proportion of oily or fatty matter, in the blood, has not been accurately ascertained, and it probably undergoes great variations in health, being generally the greatest about four or five hours after a full meal : its presence is indicated by an oily or milky appearance of the serum.

The proportion of the salts of the blood is also liable to increase or diminution, and this variation, no doubt, plays an important part in many pathological phenomena. An excess of the salts retards, as we have already seen, the coagulation of the fibrine, and when very great, prevents it altogether. A decrease in the quantity of these substances tends, according to Henle, to favour the adhesion of the corpuscles to each other; and is stated by him to exist in inflammatory affections. The same deficiency is said by Stevens and others to be present in pestilential fevers and cholera.

Independently of the variations in its natural ingredients, the blood may also undergo morbid alterations, from the presence of excretory or other matters which do not belong to it in health, or, if so, not in appreciable quantities.

Now we know, from physiology, that there are various matters, the products of the interaction of the tissues and the blood, which are in health speedily eliminated; and we also learn, from observation of disease, that if these matters are not thus removed they remain in the blood, and act as poisons.

The most important substances of this character, and those with which we are most concerned, in the treatment of disease, are the principles of the secretions of the great depurating organs, the lungs, the liver, and the kidneys; to which may be added the skin (which is correlative with and often, in a great measure, vicarious of the latter), and the glandulæ of the large intestines.

Now the depurating action of these organs may be suspended, or interrupted, chiefly in three different ways: 1st, the depurating organ may itself be unsound; 2, the circulation of the blood through it may be obstructed; or, 3, the matter to be eliminated may not be brought to the depurating organ in the particular form suited for removal by that organ.

The first of these conditions will be specially noticed, in respect to each secretion, in treating of the diseases of the corresponding organ, when the particular consequences of the retention will also be described.

In order to the due appreciation of the second and third circumstances just mentioned, as interfering with the action of the depurating organs, it is necessary to understand the general conditions essential to their full operation.

We know from physiology, that, in the course of the circulation, carbonic acid gas is formed and received into the blood, and that, if retained, it acts as a poison to the system: and we also know, that the removal of this gas is effected in the cells of the lungs; where it is exposed to the action of another gaseous fluid, the atmospheric air, which acts as a solvent of the carbonic acid; and, according to Dr. Stevens, exercises some attraction for it.

It may here be remarked that though water and carbonic acid are the only excretions or exhalations from the membranes of the air-cells in the perfectly normal state; yet, as pointed out by Dr. Alison, it is certain that many volatile matters taken into the stomach, are excreted unchanged, or but little changed, with the breath, and probably the body is thereby saved from their injurious effects. It must therefore follow, that if the free access of air to the cells or the free circulation of the blood through the lungs be impeded; there must ensue an inquination of the blood by carbonic acid, and perhaps by other gaseous excretions.

As regards the bile and the urine, the former of these secretions is a liquid consisting of water, holding, in solution, certain principles, containing a large proportion of carbon and hydrogen, which are uniformly present in health, and are in part, though probably not wholly, excrementitious. These principles, moreover, exist in healthy blood, in very minute quantities, and it is the office of the liver to remove them; their secretion taking place, as there is every reason to believe, from the minute branches of the portal vein, by means of the hepatic cells: consequently an inquination of the blood, by these substances, must ensue, if the function of the liver be suspended, or the circulation of the blood through that organ be impeded.

The presence of the bile pigment gives to the serum a yellow hue, which is another instance of change of colour in the blood; which change is also imparted to the surface, constituting the well-known jaundiced tint.

The urine again is a liquid consisting of water, holding in solution various solid matters, which may be divided into two classes: 1, those lower organic products abundant in nitrogen, formed probably in the extreme circulation, by the reciprocal action of the arterial blood and the organs of the body, on each other, such are the urea, uric acid, and urates; and 2, those soluble substances which are taken with the ingesta, and which do not undergo decomposition in passing through the system; as for instance, neutral salts formed by inorganic acids. The matters of both classes, when allowed to accumulate in the system, produce injurious effects; the former probably as direct poisons; and the latter, by giving rise to changes of the blood already noticed (pp. 24, 25); and both are carried off by the kidneys.

Of the diseases of the liver and kidneys, interfering with their secreting functions, we shall speak hereafter: but it may here be remarked, although the proposition is almost self-evident, that—if there be not a free passage of blood through these organs, the continual abstraction from that fluid of excrementitious matters cannot proceed; whether this impediment arise from venous obstruction distal to the organ, or pressure upon the afferent vessel tergal to it. Thus in the case of the liver, obstruction to the return of the blood through the cava, or to the passage into the gland from the vena portæ, would alike interfere with the due secretion of bile.

The importance of the skin in the etiology of disease may here be noticed, though the effects of its suspended or perverted action may not show themselves principally in the non-depuration of the blood: yet the non-elimination of the water arising from its suppressed action may often excite an undue action of the bronchial membrane—the mucous membrane of the alimentary canal, especially of the colon—and above all, of the kidneys.

The great office of the skin, however, appears to be the regulation of heat, for it is by the amount of heat which is rendered latent, by the evaporation during perspiration, from so extensive a surface, that the body is enabled to remain at nearly the natural temperature, when exposed to a heat of 200° F. or more.

And it is to the suppression of this function, and the consequent retention of the heat, generated in the extreme circulation; that the great increase of temperature in many febrile diseases is mainly to be attributed.

It is not, however, sufficient that the secreting organ be healthy, and that there be no impediment to the passage of the blood through it; but since the liver, and the kidneys, and also the skin, are adapted to secrete only liquids, it follows that the elements of the bile and also of the urine, cannot be removed unless they are brought to their respective secreting organs in a state of solution; therefore, a continual supply of water is necessary for the depuration of the blood; and obstruction to that supply must give rise to the inquination of the latter by the elements of the secretions of these organs.

The course of the water, fulfilling this office, is as follows. That which is received into the stomach is, with such soluble matters contained in it as are not decomposed in the *primæ viæ*, taken up by the capillary branches of the veins, which converge to form the *vena portæ*, carried onwards with the blood through the trunk of that vein, and again dispersed by its ramifications through the liver; here a portion of it is again separated from the blood, in order to form a solvent for the solid contents of the bile. Passing onwards through the pulmonic and systemic circulations, the redundant water of the blood carries with it those inorganic soluble matters which it contained at first, and receives, or rather, acts as a solvent to those products of the interaction of the blood and the tissues which have been already noticed as poisonous when retained in the system, and which are therefore expelled from it, or at least from the nourishing fluid. Holding these substances in solution, it is carried on with the current of the blood, to the other great excretory organs, the skin and the kidneys, whence it passes out of the system, carrying with it through those organs, the substances which each is designed to eliminate, but which it cannot remove unless brought to it in solution.

The entrance of the water may be opposed as it were, *in limine*, by obstruction high up in the intestinal canal; or, again, its passage into the circulation may be intercepted in the portal system, or by disease in the liver, or even, farther on, in the heart and lungs: all which obstructions may be so great as to prevent there being such a supply, of redundant water in the blood, as is required for the solution of the excretory matters, and from this cause there may arise inquination of the blood, by those substances.

Besides the above substances, which are continually formed in the course of circulation, and which are as continually removed by the depurating organs, others, foreign to the blood in a healthy state, may be present in it in disease: thus we know that the blood in health has an alkaline reaction; in some forms of disease, as stated by Vögel, the blood is neutral, or at times even acid. This depends probably upon the presence of free lactic acid, and occurs in diseased conditions, in which a tendency to decomposition in the blood may be suspected.

Pus is also said to be found in the blood; and this abnormal condition of the blood, together with the constitutional disturbance attending it, has received the name of pyæmia. It is, however, in the first place, very difficult, if not impossible, to distinguish the globules of pus from the white corpuscles present in leucocythæmia; neither has it been shown that the mere presence of pus in the blood is capable of producing the very formidable symptoms commonly ascribed to pyæmia. It is more probable that they are due to some poisonous principle or putrid elements of the blood, generated in the suppurating of ulcerating parts.—It will be necessary to revert to this hereafter.

Sugar, again, is a substance foreign to healthy blood; but in diabetes (in which disease there is probably a defect in that action of the liver by which the sugar formed in the stomach is rendered susceptible of the normal changes in the lungs) it is present in the general circulation, from which it is carried off by the kidneys, not however before the blood has become so far impregnated with it as to allow of its detection by chemical analysis.

Having now given a brief statement of the changes to which the blood, considered by itself, is liable, we proceed to speak of the derangements of the blood *in circulation.*

We have spoken of the conditions of general plethora and general anæmia as constituting in themselves determinate diseases, which may become objects of special treatment. Local plethora, however, or, as it is more commonly termed congestion, or, hyperæmia according to the French authors, besides that it is in itself not unfrequently an immediate object of treatment, occurs, either as cause or effect, in the greater number of diseases of which the living body is susceptible. It is true, indeed, that many organs and vessels, admit of a considerable range, in the quantity of blood circulating through them in a state of health, this variation depending upon the varying activity of the organ; but it is equally true that, when long-sustained or excessive in quantity, these accumulations give rise, directly, to derangement of function, and often constitute the first step towards structural change.

The consideration of this subject of congestion is essential to the right understanding of those important affections, inflammation, hæmorrhage, and dropsy. Congestion or hyperæmia may arise, 1, from the increase of the flow of blood to the part; 2, from an increase of the capacity of the part for blood; and, 3, from a diminished flow of blood from the part.

(1.) The first of these constitutes the active congestion of most authors, and the active or sthenic hyperæmia of Andral, sometimes called also engorgement. It is not inflammation, neither does it necessarily lead to it, though it bears a most important relation to that complex process, since when the latter does occur, active or sthenic hyperæmia is the first step towards it.

In order to the right understanding of the nature of congestion, and also of the right application of the means for its removal, it is necessary to bear in mind, that, an increase in the quantity of blood sent to a part, is not necessarily the result upon an increased quantity in the system at large, or even of an increase of the injecting force of the heart.

To explain this we may recur to some physiological considerations respecting the moving powers of the circulation. The first propelling power of either circulation is the systole of the ventricle by which the artery is filled and its elasticity overcome. As soon, however, as the systole is completed, the sigmoid valves being closed, the pressure which the large arteries exert upon the blood by their contractility can act only in propelling it in a continuous current, so that we may regard the large arteries and sigmoid valves as an apparatus for converting an intermitting motion into a continuous one; such as is the fly-wheel of a steam-engine; or, to use the more appropriate comparison of Sir Charles Bell, the elasticity of the artery acts, like the compressed air in a fire-engine, to produce a continuous current from a force acting at intervals.

It has been shown that, in addition to its yellow elastic tissue, the middle fibrous coat of the arteries contains non-striated muscular fibre, giving to it a degree of real muscular contractility in addition to the mere physical property of elasticity; yet there is no reason for concluding that these fibres produce any peristaltic movement which would exert a propelling force upon the contents of the vessels, though they probably have the power of regulating the calibre of the artery, for purposes to be hereafter explained.

The movement of the blood in the capillaries, however, appears to be greatly assisted by a different power, viz., an attractive force arising from, the mutual affinity of the blood in the capillaries, and the tissues surrounding those vessels.

In a word, the systole of the ventricle, acting mediately through the elasticity of the arteries, is the propelling force by which the blood is conveyed through the arteries to supply the capillary vessels, whereas the circulation in the latter is maintained by the same force, aided by the mutual interaction of the blood and the surrounding tissues.

It is a physiological fact that scarcely needs demonstration, that various stimuli, whether—mechanical, as rubbing, or scratching, or—the agency of the imponderables, as heat and electricity, or—chemical, as mustard, cantharides, ammonia, &c., or—vital, as the special stimulus of any particular organ, for instance, the application of any excretory matters to the kidneys by the blood, or the presence of an impregnated ovum in the uterus—increase the flow of blood through that part, antecedently to any increase in the force or frequency of the pulsations of the heart, and therefore independently of it; and further, that when this hyperæmia is long maintained, there ensues an enlargement in the artery supplying the part, unattended with any corresponding enlargement of the other arteries of the body; and, therefore, not to be accounted for by a general cause, such as increase in the injecting force of the heart, which must alike affect all the arteries of the system. This connection between the activity of the circulation in a particular part, and the diameter of the artery supplying that part, is probably maintained by the branches of the sympathetic nerve so freely distributed along the arteries acting upon the muscular fibre just mentioned.

This afflux of blood depending sometimes upon physiological and healthy excitement of a part, and sometimes upon diseased action, is the *determination of blood*, of authors, and may be regarded as one of the most important connecting links between health and disease.

This increase of the calibre of the arteries may be propagated still further backwards along the course of those vessels, so as eventually to influence the general circulation, and through it the action of the heart itself.

Before proceeding further, it may be well to state briefly the phenomena which are observed in the progress of local congestion, as well those which from their minuteness can be seen only in the transparent parts of animals by the aid of the microscope, as those which are appreciable by the unassisted senses, and may be observed in all the tissues when irritation has been applied to any—as in pricking the web of a frog's foot under the microscope, or the application of alcohol to a membrane. After a time varying, from a few minutes, to some hours, a change in the condition of the small blood-vessels is observed; they become enlarged and distended,* the blood also passing through them with increased velocity; at the same time that new vessels appear to be produced, most probably from those which before did not allow of the passage of the red corpuscles, or which admitted them in a quantity insufficient to render their colour apparent, now permitting them to enter freely; the globules also manifest a tendency to cohere into irregular masses, which sometimes pass through the capillaries, and may be observed in the veins. This is active congestion, or the sthenic hyperæmia of Andral.

This state of things cannot, however, continue long without leading to further change; if it have not been intense, the increased, quantity of blood, and rapidity of its movement may gradually subside, and the vessels return to their original condition; or it may pass into inflammation, to be described hereafter, or it may be relieved by effusion of the whole blood giving rise to hæmorrhage, or of the liquor sanguinis, as in fibrinous dropsy, or of serum, as in serous dropsy, or it may pass into the next form of congestion.

(2.) This form of congestion is spoken of, by authors in this country, under the name of *passive congestion*, and by Andral and the French pathologists as *asthenic*, or *passive hyperæmia*, in which the capillaries become distended with blood, and the motion of that fluid impeded. Passive congestion may also occur, without any previous acceleration of blood in the arteries or capillaries, of which we may often see instances when the lower or depending parts of aged or debilitated subjects become livid or purple; the contractility of the capillaries not being sufficient, as in health, to overcome the distending force arising from the gravitation of the blood. It also succeeds to active congestion, the increased energy of contractility in the small vessels being followed by a corresponding deficiency, so that, becoming dilated under the force of the active congestion they have not sufficient contractility to resume their original size, but remain permanently distended with blood.

(3.) Allusion has been made to impediments in the course of the circulation, causing accumulation of the blood which is following the obstructed portion, or, as it is termed, tergal to it. This form of congestion, which is called mechanical, exists exclusively, in the first instance, in the veins, though it may be propagated from them to the capillaries:—it is instanced by the effects of compression upon the venous trunks of an extremity;—by obstruction to the passage of the blood through the right side of the heart, which gives rise to venous congestion of the whole system, by opposing the return of the blood through the ascending and descending cava; though this congestion affects chiefly the parts nearest to the heart:—and by disease of the liver obstructing the passage of the blood through the portal system, and inducing congestion in the capillaries of all those parts, from which the blood is conveyed by the veins converging to form the vena portæ.

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* Alison's Pathology, p. 99.

Although many of the phenomena which have been described as constituting the state of congestion, can only be observed in the superficial textures of the body; yet we have reason not only from the considerations already adduced, but from the evidence afforded by inspection after death, for knowing that the internal organs are equally liable to the different forms of congestion. The part thus affected is to the eye redder than natural: this redness is observed under the microscope not to be general, but to follow the course of the capillaries, the interstices remaining colourless; when the part is cut into, a more than ordinary quantity of blood flows from it, the corpuscles in which have undergone little or no alteration. The affected part is also denser than usual, but the consistence is normal. A sudden or intense congestion of blood may, under some circumstances, prove immediately fatal, as when it occurs in the brain, or during congestive fever: though this is, comparatively, a rare occurrence.

In the treatment of congestion, or hyperæmia, it is necessary to bear in mind the different forms which it assumes, and the excess or defect of, the vital affinities upon which it depends. This is more especially true of the first two forms, which result from very different or even opposite conditions, but which nevertheless, as has been just observed, merge into each other by almost insensible degrees; so that when either of these conditions exist singly, the most applicable treatment is, in the case of the second, almost opposite to what it would be in the first. Of this we have a ready illustration in the case of the eye, the transparency of whose textures allows us to see the variations in the fulness of their vessels. Thus, after the application of cold, or any irritating cause, the vessels of the conjunctiva, which in health do not admit the red corpuscles, may be seen traversing that membrane in all directions, and carrying red blood; and we know that at first this condition is best relieved by remedies which depress vascular action, and is aggravated by the application of any stimulant. We also know that when this congestion has passed into its second or passive state, a change may be often detected in the vessels which appear in a more distended state than at first, having lost their vivid colour, and assumed a dusky hue; and then, stimulating or almost irritating applications will often speedily restore the natural paleness of the part, by re-exciting the contractility of the capillaries.

We cannot, indeed, actually see the same thing going on in internal parts, and, although inspection after death may give evidence of the existence of congestion, it gives us none as to its stage or character; an instance, if any were required, that morbid anatomy is a part only of pathology. It furnishes us, indeed, with much knowledge respecting the changes produced by disease, but it is not conversant with disease itself; that is, with the deranged action upon which disease depends, and of which structural changes are the effects, and not the causes. We may, however, by comparing the revelations of morbid anatomy with the symptoms observed during life, and by again correcting the deductions, thus obtained, by the known effects of remedies, arrive at pretty certain conclusions as to the existence of one or other of these forms of congestion in internal organs.

The details of the particular mode of treatment best adapted to each form of congestion, will be most conveniently considered when we come to speak of special diseases; there are, however, a few general principles, which will be best appreciated when regarding congestion simply as such, without embarrassing ourselves with the more complex phenomena with which it is commonly associated.

The most obvious means of relieving any congestion would, at first sight, appear to be the abstraction of blood from the system, which, by diminishing the whole volume of the circulating fluid, might be expected to lessen, in the same proportion, the quantity supplied to each particular organ. Experience, however, has not shown this to be the case; since not only are those, apparently the most ex-sanguine, equally liable, with others to local congestions, or even more so; but also, in many instances, where a congestion has been established, it would appear as if the system might almost be drained of its blood, and yet, that, that which remains, as if obedient to the local stimulus, still rushes in a redundant quantity to that part. One reason of this may be, that, by abstracting blood from a vein, or a branch of an artery, we diminish, though only for a time, the volume of the blood in the larger vessels, and at the same time depress the action of the heart, without materially affecting the movement of the blood in the capillaries, which, as we have already seen, though not independent of the former, is yet greatly influenced by forces affecting wholly the capillary system. The influence of bloodletting is, perhaps, fairly stated by Andral, in the following words. "By the employment of bloodletting, the organ congested is relieved of a part of its superabundant fluid; the general mass of blood in circulation is diminished; and a powerful cause of irritation thus withdrawn from the system; but neither by local nor general bleedings can we remove the unknown cause, under the influence of which the hyperæmia was originally developed. If, however, this cause be not particularly active or violent in its operation, its influence may be considerably diminished, or even completely paralyzed by sanguineous abstraction, as the blood is thus withdrawn from the seat of irritation, as often as it tends to accumulate there, and the hyperæmia is thus prevented from establishing itself in the part; but if the exciting cause of the congestion be more violent in its action, we shall in vain attempt to remove it by bloodletting. . . . . It is, therefore, the exciting cause which we should endeavour to investigate and counteract, and not exclusively confine our attention to the local congestion, which is merely an effect: an elementary part of a very complex phenomenon." According to the above view, which is, to say the least, not too unfavourable to the use of bloodletting, it is not merely the consideration of whether the congestion be active or passive, that is to guide us in the use of that remedy, as even, in the case of the former, it may aggravate the mischief; since a local hyperæmia, in an anæmic state of the system is a greater evil, than where there is a normal condition of the general circulation. That a local congestion may be accompanied by increased action of the heart and large vessels, and may even excite such increased action, has been already explained, and it is evident that the effect of the latter must be to maintain, or even to aggravate congestion; and it is under these circumstances that benefit may be expected from the general abstraction of blood. It is then by the force of the heart's action that we are mainly to be guided, such force being measured not so much by the impulse which seems to be given to the blood in the artery, as by the power with which it resists the pressure of the fingers. Even these indications, however, must be received with the greatest caution, if not altogether disregarded in cases of congestion arising in the course of exanthems, or other diseases, of the general system, excited by morbid poisons.

Local depletion, when it can be applied, presents a better prospect of relieving local congestion, since by it we may hope to unload directly the extended capillaries, and this too by the abstraction of a quantity of blood far less than could be expected to produce any relief by general bleeding. It unfortunately happens that, in the greater number of cases, we cannot remove blood directly from the part affected; when, for instance, we suspect an internal congestion, we may indeed have recourse to leeching or cupping over its probable seat, by which means we may relieve neighbouring vessels; but these are often supplied by different arteries from those distributed to the part affected; and consequently we cannot expect the same result as would be produced by emptying the gorged capillaries of the part. Still we have reason to believe, from experience, that we may, even in this way, check or control the disease; though the mode by which this result is produced is not very easily explained. Much indeed may be attributed to the revulsive action of the leeches or cupping-glasses, especially of the latter; but this is hardly sufficient to account for the effects produced.

General bleeding, then, is applicable, in active congestion, only when there is considerable increase in the force and frequency of the heart's action, as shown by the arterial pulse, this being often the condition when such congestion is merging into inflammation. Local depletion, from a part near the seat of the congestion, is beneficial when we have reason for believing that the congestion is of an active character, although there be no great increase of the heart's action. It must, however, here be urged, that regard should be had to the general condition of the system before venturing even upon this less powerful mode of depletion; for it must be borne in mind that by the means ordinarily employed blood is removed from the smaller arteries and veins as well as from the capillaries, and therefore that the effects of the depletion are not solely confined to the latter vessels, but in some states of the system they show themselves strongly upon the action of the heart and large vessels. The advantage of the *truly* local bleeding, that is, of relieving directly the capillaries of the part affected, where it can be done, as when the congestion is situated on the surface, applies to the passive equally with the active form; since the blood thus removed flows almost entirely from the distended capillaries, where it was in a state of *stasis*, entirely removed from the pale of the general circulation, and, therefore, unlikely, by its abstraction, to produce any depressing effect upon its moving powers.

There are various medicines and applications which are reckoned as sedatives to the circulation; of these the former are chiefly of the nauseating kind, as tartar-emetic, digitalis, and colchicum; and although it is doubted by many whether this sedative agency can be exerted, unless nausea be also induced, that they do exert such an agency is certain, though they do not appear to act each on the same class of vessels. Of the agency of colchicum we know but little, though its sedative effect seems to be produced mainly through the heart and large vessels. Digitalis, again, is a sedative to the heart, though it may very fairly be asked whether this sedative action is not produced by checking the capillary circulation. The tartarized antimony, on the other hand, though it unquestionably exercises some depressing influence on the heart, has certainly as great, if not greater influence upon the capillaries, and is therefore one of the most efficient means we possess of combating active hyperæmia.

A very important means of producing a sedative effect on the whole system, including the capillaries, and therefore advantageous, or rather essential, in the treatment of active congestion, is what is termed the antiphlogistic regimen, by which is meant unstimulating diet, the avoidance of muscular exertion and mental emotion. The external application of cold, as by effusion, or by its more continued local application, is a powerful sedative, and sometimes very useful, though, unless it be carried beyond the limits consistent with perfect safety, its effects are but transient; applied locally for any considerable time, as when cold applications are used to erysipelas of the scalp, it is apt to set up secondary hyperæmia, often more dangerous than the primary disease.

It has been already observed that when a hyperæmia, or congestion, has passed into the asthenic or passive state, the depressing or sedative remedies are productive of harm rather than benefit, whereas stimulant, tonic, or astringent remedies, become serviceable. The indications which the latter remedies are here calculated to fulfil are, 1, to excite the action of the heart and large vessels, and thereby increase the *vis a tergo*, by which the blood is to be removed from the distended capillaries; 2, enable the latter vessels to relieve themselves by increasing their contractility; and, 3, it may be, by acting upon the nervous system, through the organic nerves, and thereby increasing the vital activity, upon which depends the interaction between the tissues and the blood in the capillaries.

The most direct stimulants to the action of the heart are alcohol and æther taken into the system, and their judicious employment is often followed by the best results in passive congestion. It must be remembered, however, that their action is not only transient but apt to be followed by a corresponding depression; this may be in some measure counteracted by administering them in small doses frequently repeated. Ammonia probably acts more upon the nervous system than immediately upon the heart; it has, however, a secondary and stimulating influence upon the organs of circulation. The effect of internal medicines in directly increasing the contractility of the extreme or capillary arteries may perhaps be doubted, though when a passive congestion is within reach, astringent and stimulating substances locally applied restore the tonicity of these vessels. The benefit moreover of a tonic regimen, aided by medicines of the same character, as cinchona, quinine. and the other vegetable tonics, or (when the state of the system seems to call for it) by mineral tonics, as iron or zinc, cannot be doubted.

The third form of congestion depending mainly upon mechanical obstruction to the return of the blood through the veins must be combated mainly by endeavouring to remove these obstructions, or, when this cannot be effected, by regulating the circulation so as to adjust it as nearly as possible to the altered condition of the system. Local depletion may sometimes be called in to aid in fulfilling this latter indication, and it may even become necessary to abstract blood generally, though this latter must be regarded only as a measure adapted to a passing emergency, since congestion of this character is, in the greater number of instances, mainly dependent upon a defect in the moving powers of the circulation, and therefore the probability of its recurrence is increased by whatever tends to lessen the force of the heart's action.

IV.

INFLAMMATION.

Having now briefly considered the more simple dynamical, or functional, derangements of the solids, as well as of the blood, we proceed to that more complex, and most important affection —Inflammation,—a process into which enter nearly all the elementary morbid changes which we have been considering, since we have—changes in the irritability and in the contractility of the vessels of the part,—changes in the blood and in its attraction for the tissues,—changes in the nervous force, and—changes in the nutrition of the part.

The word inflammation, derived from *inflammo*, 'I burn,' was probably suggested in the first instance from fanciful and erroneous notions respecting the disorder which it was used to denote. It is however now retained as a conventional term, used, without reference to its literal and original meaning, to express a certain process or series of phenomena about which medical men are in the main agreed; and so used it is preferable to many words by which it has been proposed to replace it, since it is not easy to disentangle them from the theories upon which they have been founded, and which may eventually prove to be erroneous.

Pain, swelling, heat and redness, have been, from the earliest ages of medicine, recognized as the indications of inflammation in any part in which they are combined. These conditions are not, however, all of them invariably present in any great degree, thus the degree of pain will vary much, according to the structure and sensitiveness of the part affected. It is much less in inflammations of the mucous membranes, and of the parenchymata of the several viscera, than in those of denser structures, as the serous membranes, or of parts more abundantly supplied with nerves of common sensation, as the skin. The swelling and redness vary according to the texture of the part and intensity of the inflammation. The heat, again, belongs almost entirely to the commencement of the inflammation, and is most manifest in those parts which are the furthest from the centre of the circulation, and of which the ordinary temperature is consequently the lowest; since, in the most intense inflammations, the heat seldom rises above the healthy standard of the blood at the heart.

In order to complete the description of inflammation, we must add, to the pain, swelling, heat and redness, a tendency to the effusion from the blood-vessels of fresh matter, generally *liquor sanguinis*, speedily assuming the form of coagulable lymph, or of pus. It is true, indeed, that these consequences may sometimes not ensue, owing to the slight degree or short duration of the inflammation. Still we may fairly argue from precisely similar instances, that they would have done so, but for the above circumstances. "A peculiar perversion of nutrition or secretion," to use the words of Dr. Alison, "we may hold to be essential to the very existence of inflammation;" and in this, it may be observed, consists the difference between inflammation and active congestion; the latter, indeed, may be induced by stimuli external to the vessels, but the phenomena of congestion, *as such*, are confined to the vessels; whereas inflammation, being extra-vascular, and implying a perversion of nutrition, implies also a disturbance in all the tissues concerned in nutrition. Now, as is observed by Professor Paget,* "the conditions of the healthy maintenance of any part by nutrition, are, 1, a regular and not far distant supply of blood; 2, a right state and composition of that blood; 3 (at least in most cases), a certain influence of the nervous force; and, 4, a normal state of the part in which nutrition is to be effected. All these are usually altered in inflammation." It is not therefore to the blood and blood-vessels alone that we are to look for an explanation of the phenomena of inflammation.

In the first commencement of inflammation, as observed immediately after the application of a stimulus capable of exciting it, the minute vessels of the part become contracted, and the movement of the blood in them is quickened, according to many authors; though very accurate observers, and amongst them Professor Paget, maintain, and probably with truth, that there is no quickening, but rather a retardation of the flow of blood simultaneously with the contraction. After a time, however, an opposite condition of the capillaries may be observed, they become distended and dilated, and the movement of the blood in the focus of the inflammation is retarded, and in some capillaries it stops entirely; whilst around this focus the blood runs quickly in tortuous, and distended, vessels, and, still further off, it runs, still more quickly, but through less distended vessels.

Over the whole surface of the inflamed part, a number of small vessels become apparent, which could not be seen before: this is, no doubt, owing to capillaries allowing the passage of the red corpuscles, which could before admit only the *liquor sanguinis*, or colourless liquid of the blood. Besides being enlarged, the blood-vessels are otherwise changed in shape; they are elongated, and consequently rendered more tortuous, and they also, as stated by Professor Paget, from observations by Kölliker and Hasse, have a tendency to become aneurismal or varicose. The movement of the blood is further affected by the arrangement of the red corpuscles, which cohere into irregular masses, distending the blood-vessels, which often appear regularly crammed with them: "and often," says Professor Paget, "when there is stagnation in a considerable artery, one may see the blood above, or behind, it pulsating with every action of the heart, driven up to the seat of stagnation, and thence carried off by the collateral branches; while in the corresponding vein it may oscillate less regularly, delaying till an accumulated force propels it forward, and, as it were, flushes the channel."

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* Lectures on Inflammation.

It is to be observed that the increased calibre of the vessels and the accelerated flow of blood through those around the part where the inflammation is the greatest, appear to do more than compensate for the retardation and stagnation at the central parts of the inflammation; so that the quantity of blood circulating through, and around, an inflamed part exceeds the quantity in health; for it has been ascertained that the blood returned by the veins from an inflamed limb is at least three times as much as that returned by the corresponding veins on the opposite side.

Thus far, the changes which have been described in the blood-vessels coincide pretty closely with those which have been pointed out as occurring in congestion; but congestion and inflammation are not therefore to be confounded. Congestion is in many instances a strictly natural and healthy process—the afflux of blood in obedience to natural and healthy stimuli, to a part where an increased supply is wanted for physiological purposes. Of this we see instances in the impregnated uterus, and in the increased vascularity, of the tissue whence the horns are nourished, when they are reproduced after having been shed. Congestion, indeed, almost always accompanies inflammation, but it is rather to be considered as a consequence of that excitement or irritation, whereby the inflammation is set up, than as itself forming the first stage of the inflammation.

Whilst the above changes are taking place in the capillaries, and the surrounding textures, which are the seat of the inflammation, the blood in the vessels of the part likewise undergoes alteration. This alteration includes not only changes in its chemical and physical, but also in its vital properties; by which latter, is meant, its adaptation to the nourishment of the tissues to which it is distributed.

We have before spoken of the tendency, sometimes manifested by the red corpuscles, to arrange themselves in rows like rouleaus of coin: this tendency, which was first distinctly pointed out by Mr. Wharton Jones, and which is so efficient a cause of the buffy coat, is one of the changes which take place in the blood in inflammation. Much of their colouring matter has also been observed to escape from them, diffusing itself through the liquor sanguinis, and giving to the blood the appearance of a uniform red mass, interspersed throughout with colourless globules. These globules have been by some supposed to be, the nuclei of those red corpuscles, from the investing membranes of which, colouring matter has escaped; an opinion which is at variance with the views now entertained respecting the structure of the corpuscles. It is more probable, therefore, that the globules alluded to, are the white or rudimental corpuscles of the blood. The red corpuscles are (throughout the system) diminished in inflamed blood; though they may be present, in an increased proportion, at the seat of the inflammation.

The fibrine and white corpuscles are in excess in inflamed blood, though, from the difficulty of separating these two principles, it is by no means certain, whether this excess is to be attributed chiefly, to one or the other. It is probable, however, that when the inflammation occurs in healthy subjects, the increase takes place almost entirely in the fibrine, but that in debilitated subjects, it is due mainly to the corpuscles. Andral states that, in strong subjects, the proportion of fibrine, during inflammation, may reach as high as, from five to seven, or even eight, per thousand, of the whole blood.

Besides the increase in its quantity, the fibrine of the blood undergoes a change no less remarkable, in its power of fibrilation or coagulation; a circumstance which materially facilitates the formation of the buffy coat in inflamed blood. It has already been shown, (p. 23,) that, the slower coagulation of the blood, the more rapid subsidence of the red corpuscles, and increased proportion of the fibrine (all which conditions are present in a greater or less degree), promote the formation of the buffy coat; but, that there is some other cause, tending to produce it, is evident from the facts,—that, the separation of the liquor sanguinis from the red corpuscles, may often be observed in inflamed blood, before the time that coagulation would have commenced in the healthy state,—and, that this separation may take place, in films of blood, so thin, as not to allow of a stratum of liquor sanguinis being laid above one of red corpuscles.

The conditions which concur for producing the buffed and cupped clot of inflammation, appear on the whole to be as follows—relative diminution in the number of red corpuscles, and proportionate increase in the quantity of fibrine or of white corpuscles :—more rapid and closer aggregation of the red corpuscles into rolls, and of these again into masses having large intervening spaces filled with liquor sanguinis. To the above may be added a continued slow contraction of the fibrine after the separation of the clot; the effect of which is, that its upper layer being disengaged from the red corpuscles, its edges are drawn towards each other, and thus is given to the surface that concave form which is commonly called, "cupped."

Two other changes of the blood in inflammation — the diminution of red corpuscles, and increase of water; which, as we have already seen, favour also the formation of the buffy coat; although they are but little adapted to explain any of the phenomena of the local process, nevertheless furnish us with a resemblance between the condition of the blood in inflammation, and in several states of the system which are commonly believed to be the most opposed to it; but in which the accurate clinical observer is well aware that it frequently arises—viz., spontaneous anæmia and that state of the system which is induced towards the close of many protracted diseases.

It is very true, as is observed by Professor Paget, that none of the conditions, the existence of which has been *ascertained*, either by chemistry or by microscopical observation, are sufficient to explain the local phenomena upon any known principles. But as it is known that many instances occur, in which inflammations have their origin in a morbid condition of the blood, we are compelled to believe that such morbid condition may exist, though it elude both chemical and microscopical observation; and must, in the present state of our knowledge, be described as a loss, of adaptation to the purposes of nourishment, and consequently, of the mutual affinity between the blood, in the capillaries, and the surrounding tissues.

Of the condition of the nerves during inflammation, nothing can be known by actual demonstration. That disturbance of the nervous influence may of itself excite inflammation, we know from the effect upon the tissues of the eye produced by disease or injury of the fifth nerve; and also from the sympathetic inflammation which is communicated through the nerves of an inflamed part, to those of another part. That irritation applied to the sentient extremities of the nerves, will produce a certain degree of inflammation, is apparent from the eruption upon the surface produced by electric sparks.

The pain felt in an inflamed part also suggests the idea that the nerves of that part are in what is termed a highly "excited" state, and of this there is further evidence in the extreme tenderness, and susceptibility to every stimulus. That pain, and that very intense, may often exist without inflammation we know; still it is not to be overlooked, that in very severe paroxysms of pain, as in facial neuralgia, there arises an inflammatory œdema and redness of the part.

It may, perhaps, be too much to assert that disturbance of the nervous system is as much an essential part of inflammation as is that of the vascular; yet we have seen that congestion or excitement of the vascular system may exist without inflammation. We know also that congestion, long continued, is apt to result in inflammation, and so also is long-continued pain or excitement of the nervous system; and if it be said that inflammation may exist in parts which are scantily if at all supplied with nerves, so also, it may be answered, will it arise, as in the cornea, in parts which have no vessels.

That inflammation may be induced by an altered condition of the part, independently both of the blood-vessels and nerves, is apparent from the instance just cited of the cornea, which has neither; and as regards the increased afflux of blood to an inflamed part, we will again repeat what has been before insisted upon, viz., that it is the condition of the part which determines the supply of blood rather than the supply of blood the condition of the part.

It is not therefore to be inferred that inflammation may not arise, from disturbance either in the blood-vessels, the blood, the nerves, or the proper elements of the part itself; but that the state, commonly recognized as inflammation, cannot be fully established without involving them all; and as it may begin in any one of these disturbances, so is it impossible to ascribe to either the precedence in the order of sequence, and therefore they should be studied as contemporaneous events, rather than as following each other in any necessary series.

The local changes, just described, are followed by certain consequences which have been treated of by many authors as the terminations of inflammation: thus we read of inflammation terminating by resolution, by effusion, by adhesion, by suppuration, by ulceration, and by gangrene: strictly speaking, however, the first and last, viz., resolution and gangrene, are the only true terminations, since the different effusions may take place at any period of inflammation, and are not necessarily attended by its subsidence, although the term abscess, from *abcedo*, applied to a circumscribed suppuration, would seem to imply the notion of a departure of the inflammation.

Resolution, which is in reality a subsidence of the inflammation, occurs when the state which we have just been describing passes away without leaving any permanent change in the part which was the seat of the inflammation. This subsidence takes place by precisely the same steps as, those by which the inflammation had been established, but in an inverted order. The swelling diminishes, the rapid motion of the blood in the vessels surrounding the seat of the inflammation abates, whilst at the focus of the inflammation, where stagnation had been established, the agglomerated corpuscles may be seen to separate and pass off in different channels, and the blood resumes its motion ; the vessels gradually return to their former calibre, and recover their contractility, the redness and heat of the part disappear, and it is finally restored to its former condition.

This termination is the most favourable result that can ensue in inflammation, provided it be not followed by diseased action elsewhere.

Sometimes, however, inflammation undergoes resolution, and that very rapidly in one part, to be set up again as rapidly in another, continuous with that in which it commenced. This disposition to a continuous transference of inflammation, by which it appears to creep along from one part of the same membrane to another, is more frequent in some textures than in others, as in the skin and the mucous membrane of the bronchiæ, and also in some varieties of inflammation than in others.

It happens also, not unfrequently, that the inflammation suddenly subsides in one part and reappears immediately, and with the same intensity, in others remote from it, though generally in a structure similar to that which it has left. This sudden removal of inflammation from one part to another is particularly liable to recur in acute rheumatism and some other inflammations of a specific character, and it is termed *metastasis*.

This transference of inflammation from one part to another is a circumstance of which we often avail ourselves, by endeavouring to imitate it in setting up an inflammation on an external part with the hope of withdrawing or subduing a more serious and dangerous one within. This mode of treatment is called counter-irritation ; the terms derivation and revulsion are also used to express it. It is not improbable that the subsidence of an inflammation, after what have been called critical discharges or evacuations, is an instance of fortunate or beneficial metastasis; as it proceeds from a congestion connected either in the way of cause or effect, with the subsidence of the primary inflammation.

When resolution does not take place, the characteristic effusions of inflammation begin to make their appearance as soon as it is at its height.

The first of these products or effusions is the so-called *serous* effusion, from its apparent similarity to the serum of blood. When the inflammation is at its height a colourless liquid exudes from the capillaries, either infiltrating the surrounding tissues, or if the seat of inflammation be a secreting surface, increasing the secretion of the part. When, for instance, the inflammation is in the areolar tissue, we have from this cause a great increase of the swelling, and if it be a closed cavity we have accumulation of fluid in that cavity. It however rarely happens that this is true serum of blood; it is, in fact, as was long ago pointed out by Dr. Babington, in the paper already alluded to, *liquor sanguinis*, or blood deprived of its red corpuscles. This effusion has been described by Paget, under the term fibrinous dropsy, and differs from the true serous dropsy in that it contains fibrine, and is capable of coagulating after it is removed from the body. Another form of liquid effusion is pointed out by Professor Paget as happening from serous inflammatory matter capable of organization into cells.

The fluid containing fibrine has generally the appearance of serum, from the circumstance of its retaining its fluidity, which it will do for a considerable time within the body, and that too after death. The reason of this delay in the coagulation is by no means certain, though it is probably due to the retention of the ammonia by which the fibrine is held in solution: it is, moreover, a propitious event; for so long as the effusion is liquid, absorption may ensue on the subsidence of the inflammation.*

It may happen that pure serum is effused in inflammation, but this is only in its lowest forms; and this serum is very rich in water; but, as a general rule, it is exceedingly rare as an inflammatory product.

The same may be also said of blood, which, though it has been reckoned among the effusions of inflammation, never occurs unless it be from the rupture, either of some of the highly congested capillaries, or of those delicate vessels which are formed in recently coagulated lymph. In the former case the hæmorrhage is termed primary, and in the latter secondary; but in either it is to be regarded rather as an accident than as one of the natural results of inflammation. It not unfrequently occurs that the colouring matter of the corpuscles is dissolved in the effused fluid, giving it the appearance of blood; which no doubt has led to the belief of the red corpuscles having transuded through the walls of the vessels.

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* Paget, opus citat.

We have already seen that *true* serum rarely occurs as an inflammatory effusion; the characteristic product of inflammation being the blood-plasma, or, as it is commonly termed, lymph; which we will designate inflammatory lymph, to distinguish it from other substances to which this term is applied. Of this inflammatory lymph the so-called serous effusions are merely modifications, and, like them, it occurs under two varieties, the *fibrinous* and the *corpuscular.*

The fibrinous variety occurs when the liquor sanguinis, which is poured out as before stated, becomes of a thicker and more gelatinous character, and at last assumes a form closely resembling, in appearance and composition, the buffy coat of the blood,—the adhesive inflammation of surgeons.

This product of inflammation may be seen most plainly in the formation of adventitious deposits, which are frequently found upon serous membranes, sometimes gluing together their opposed surfaces, such as, the pleura pulmonalis and pleura costalis, or on the free and attached surfaces of the pericardium, after an attack of inflammation of either of these membranes. The lymph is sometimes effused with the serum, the latter remaining unabsorbed in the cavity, whilst the former adheres to its serous lining, or in cases of less active inflammation remains in loose shreds, which subside to the lower part. At other times the lymph or fibrine alone is effused; or, which is more probable, the serum is absorbed almost as fast as it is poured out; and the result is, the deposition of lymph alone upon the surface of the membrane, little or no serum remaining in the cavity.

Now, it being one of the properties of inflammation, of which no satisfactory explanation has as yet been given, to propagate itself from one surface, to another in contact with it; especially when these surfaces are similar structures; the consequence must be, that since the opposite surfaces of serous membranes, when not separated by effusion, are always in contact with each other, the inflammation of one portion of such membrane,—the pleura pulmonalis, for instance,—must, in the absence of such fluid, give rise to inflammation of the corresponding part, of the pleura costalis; and the lymph, poured forth by each, forms, as it were, a cement by which these parts are united, the union becoming firmer by its subsequent organization. A very similar process takes place in the inflammation of the areolar tissue of the body, of the spongy texture of the lungs, and other parenchymatous viscera; the lymph effused into the interstices assuming the solid form, sometimes almost immediately, at others not till after a considerable time. In the former case the result is a hardening almost from the first; in the latter, there is first a swelling or distension of the part, which pits under the pressure of the finger, owing to the infiltration of the texture by the liquor sanguinis; afterwards, the serum being absorbed, the part becomes hardened by the coagulation of the lymph or fibrine.

The exudation of lymph or fibrine does not very often happen upon the free surfaces of mucous membranes, though it does sometimes occur when the inflammation is very intense, as in the case of the exudations in the larynx, trachea, and bronchi, in croup and its cognate diseases, and in the patches in the larger intestines in dysentery.

It also takes place in the areolar tissue beneath such membranes, giving rise to a thickening, which encroaches upon the tube which it lines, and causes a diminution of its calibre, as in stricture of the urethra.

"In the corpuscular variety of lymph," says Professor Paget,* "no coagulation, in the ordinary sense of the word, takes place, but corpuscles form and float free in the liquid part. Typical examples of this form are found in the early formed contents of the vesicles of herpes, eczema and vaccinia, in the fluids of blisters raised in cachectic patients; in some instances of pneumonia, and in some forms of inflammation of serous membranes." These corpuscles, *exudation corpuscles*, or *exudation cells*, resemble, in their first appearance, the white corpuscles of the blood, though they admit of many varieties in their subsequent changes.

The above varieties, namely, the fibrinous and the cellular, constitute the typical forms of inflammatory lymph; but, it will very commonly happen that the effusion is of a compound character, the fibrine and the corpuscles being mixed in various proportions, and according as the former or the latter preponderates, will be the probability of the lymph being organized into tissue, or degenerating into pus, or some other inorganizable product; the probability, in short, of adhesive or suppurative inflammation.

It becomes, therefore, a matter of great practical importance to ascertain what are the conditions upon which depend the effusion of one or the other form of lymph.

It has generally been stated that this is determined mainly by the character of the tissue in which the inflammation is seated, and it is undoubtedly true that, *cæteris paribus*, adhesive inflammation is more likely to take place in some tissues, and suppurative in others. Thus, in serous membranes the inflammatory lymph is commonly fibrinous, and, having a great tendency to form adhesions; whilst that effused in inflammations of mucous membranes, is prone to assume the form of pus. But it is also true that the same tissue, even when excited to inflammation by the same cause, may pour out either fibrinous or corpuscular lymph; thus the fluid of the vesication of a blister applied to a healthy subject, deposits shreds of fibrine, whereas, as we have already seen, the same fluid in a cachectic subject contains merely exudation corpuscles, and has no power of spontaneous coagulation: again, the fluid effused in inflammation of the pleura, occurring in a person of previously good health, is highly plastic, whereas that effused under the same circumstances in a debilitated subject, contains little or no fibrine, but becomes speedily puriform: it follows from this, that independently of the nature of the tissue affected, the character of the effusion is greatly influenced by the state of the blood, of the nervous force, or the general health of the patient.

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* Lectures on Inflammation.

Besides these conditions, the character or intensity of the inflammation will often determine the nature of the effusion: thus we know that the skin, under inflammation of what is termed a specific character, as eczema, herpes, small-pox, and erysipelas, effuses the corpuscular lymph alone; though that tissue, in its normal state, pours out fibrinous lymph in common inflammation; whereas the mucous membrane of the trachea will, on the other hand, pour out plastic fibrinous lymph under the intense inflammation of croup. There are, then, three conditions influencing the character of the inflammatory exudation:—

(1.) The nature of the part or tissue that is the seat of the inflammation.

(2.) The state of the blood, and of the general health.

(3.) The character and intensity of the inflammation.

Mucus is another substance which has been reckoned among the products of inflammation; but there can be little doubt that, in the majority of instances, the apparently increased exudation from a mucous membrane, in which inflammation has been established, is owing, mainly, to the inflammatory lymph mixing with the natural secretion of the part: though the secretion of proper mucus is often increased likewise and with it the quantity of epithelium, with which are mixed immature epithelial cells.

It appears probable that too much stress has been laid, by systematic authors, upon the essential difference between the products of inflammations of serous and mucous membranes: for in an established inflammation of one of the latter, there will appear the ordinary products of inflammation of serous membranes or of other parts; the difference consisting only in the fluid in which they lie. Their increased proneness to degeneration, and consequent diminished susceptibility of development when so mixed, produce a greater tendency to puriform effusions from mucous surfaces than from other textures.

The inflammatory lymph in its progress towards development or degeneration, undergoes changes, the history of which constitutes a most important part of the doctrine of inflammation.

The inflammatory lymph, like the blood from which it is separated, has a life of its own, and is capable of acting as a blastema, originating new formations, independently of the blood-vessels; although the presence of the latter constitutes one of the conditions, without which, that life cannot be indefinitely prolonged. It is also necessary to bear in mind that the progress of the inflammatory lymph towards more complete organization, cannot commence until the inflammation subsides; as before that happens, fresh lymph will be continually poured out, and that already effused may undergo, degeneration, but never, development.

The fibrine of the effused lymph, after its first coagulation, is of a soft, flocculent, or semigelatinous consistence; it soon, however, evinces a remarkable tendency to shrinking, or, rather, contracting in bulk, owing to which we find not only an increased hardness of different structures, as one of the consequences of inflammation, but a remarkable drawing together of the parts into which the effusion has taken place, or shrinking of the surface upon which it has been deposited. After some time red striæ may be observed in the new product, appearing like continuations into it, of the vessels of the tissue from which the lymph had been effused. It has been much questioned whether these vessels are really prolongations of those of the original tissue, or whether they are formed *de novo* from the effused cytoblast. The latter is the opinion of Vögel, who states that he has arrived at it through a large number of observations; and adds, that it is only at a later period that they connect themselves with the previously existing normal vessels; the blood which they contain, before uniting with the latter vessels, being probably produced anew in the same manner with themselves. Professor Paget, on the other hand, maintains that all the vessels in inflammatory lymph are formed by outgrowth of adjacent vessels, in which opinion he is supported by Mr. Travers, Mr. Quekett, and others; and it cannot be denied that there are many sources of fallacy in the observations by which the opposite opinion is supposed to have been established. At the same time that these vessels are being formed, the fibrinous lymph passing through the stage of a nucleated blastema, assumes the characters of the fibro-cellular or areolar tissue of the body, and its organization may be said to be completed.

The corpuscular lymph, though more prone to degeneration than the fibrinous, is also capable of organization, which is generally effected, according to Professor Paget, through the elongation of its cells, and it is through the development of these cells, that granulations, hereafter to be described, are produced. Besides the fibro-cellular tissues, there are two other structures which may be formed from lymph, namely, epithelial cells, and bone; the first of these are formed in the skinning of superficial wounds and sores, and on membranous inflammations; the latter is formed from lymph effused in inflammations occurring in or near the periosteum; the earthy amorphous deposits occurring in false membranes formed by the organization of inflammatory lymph, and which are the result of the subsequent degeneration of such tissues, are to be distinguished from the products of the ossific inflammation.

Besides these changes, which constitute the development of inflammatory lymph, into organized tissues constituting integrant parts of the living body, others may occur, by which it retrogrades into substances of a lower degree of vitality less removed, that is, from inorganic matter, and consequently more prone to disintegration, but, at the same time, more susceptible of absorption. A brief enumeration of these changes will greatly aid the explanation of several of the consequents of inflammation; though for a more complete account of them the reader is referred to the admirable lectures of Professor Paget, already quoted.

(1.) It may undergo a simple wasting or drying; the fibrine showing no tendency to organization, but becoming merely closer and firmer.

(2.) A very important degeneration to which the fibrine of the effused lymph is liable, is a change closely resembling the fatty degeneration in muscular fibre, which has been long known to pathologists as a simple lesion of nutrition, and one to which the last-named tissue is peculiarly liable in old age. In the lymph poured out in the lower forms of inflammation, or in very unhealthy subjects, minute drops of oil may not unfrequently be detected; while the fibrine of the lymph is very soft, and easily broken. This oily, or fatty matter, with the ill-formed fibrine by the degeneration of which it is produced, is the principal constituent of the "aplastic lymph" effused in inflammations of serous membranes in unhealthy subjects, and "to the same source," as observed by Professor Paget, "we may trace most of that molecular and granular matter which is usually mingled—with pus formed by the suppuration of inflammatory indurations,—with the variously-changed corpuscles of scrofulous matter,—or with the granule-cells, and other corpuscles of pneumonia and the like inflammations: at least, this disintegration of fibrine is probably a frequent origin of such molecular matter; while the quantity of fatty matter present in pus and the products of pneumonia, and its gradual increase while pus is retained in an abscess, confirm the view that the changes here described are of the nature of fatty degeneration." It is very probable, and, moreover, important to be remembered in practice, that this degeneration of fibrine into a lower organic product, fat, is highly beneficial, bringing the lymph into a state more susceptible of absorption, and thereby facilitating resolution, the most favourable termination of inflammation.

Another change is the calcareous degeneration, of which we see traces on the valves of the heart and on the surface of the pericardium, though this change is less frequent in the fibrine, than in more advanced products of inflammation.

Another degeneration is the pigmental.

The corpuscular lymph is also liable to undergo degenerations similar to those which have been already described as occurring in the fibrinous exudations; thus the corpuscles may wither and dry in any stage of their development, as in the cheesy, ochre-coloured scrofulous matter.

The fatty degeneration of corpuscles is shown in their transition into granule-cells, and may appear at almost any period of their development; and it is probable too that, as in the case of fibrine, this change is a step towards the absorption of the lymph. We pass on, however, from these, to speak, of the most important and most frequent degeneration of lymph-cells, viz., the puriform, or, in fact, of the process of suppuration.

It may be well to state, first, that pus is an opaque and homogeneous fluid, of a creamy consistence, pale-yellow, or rather yellowish-drab colour; it has a greasy feel when rubbed between the fingers, and when fresh and warm, it has a very slight mawkish odour (*ως ηχιστα δυσωδης*); its specific gravity is from 1030 to 1033. Such is the pus formed in healthy wounds, or in mature abscesses, which may be regarded as the normal, or standard pus—the "*pus laudabile*" of the older authors.

This fluid, though apparently homogeneous, consists, in reality, of two parts—a colourless serous fluid—and minute organized bodies, the corpuscles of the pus.

The fluid or serum of the pus is in all respects the same as serum of the blood. The corpuscles are of greater specific gravity than the serum in which they are suspended, varying in size from the $\frac{1}{200}$ to the $\frac{1}{300}$ of a line in diameter, and are, for the most part, organized cells, consisting of a cell-wall, with a nucleus attached to its inner surface.

These corpuscles were at one time supposed to be altered blood corpuscles; but there is every reason to believe that they are, in the majority of cases, as has been shown by Professor Paget, formed by the degeneration of the corpuscles of the corpuscular lymph; though it is apparent, from instances which he has himself adduced, that the fibrine of the fibrinous lymph is also susceptible of a similar degeneration.

The process of suppuration ordinarily assumes one of the following forms, depending in a great measure upon the tissue involved.

When a considerable extent of areolar tissue has been inflamed, the part after having been red, swollen, and œdematous, becomes hard towards the circumference and softer and boggy towards the centre. This indicates that pus is about to be deposited in a reservoir surrounded by a wall of fibrinous or coagulable lymph.

It may be observed, that in this case we have the two different forms of inflammatory lymph. At the circumference we have the fibrinous variety, the fibrine of which, becoming solid in the cells of the areolar tissue, forms the wall of the abscess: and in the centre the corpuscular variety, the corpuscles of which speedily undergo the puriform degeneration. Now the effect of pus diffused through a tissue is to soften it, and as it were to substitute itself for it, so that there remains a central portion consisting wholly of pus; the consequence of which is, that we have a stroma or sac of solid fibrinous matter, and a contained portion consisting of pus—this is an *abscess.*

The difference in the situation, in which these two results of inflammation show themselves throws some light upon the circumstances which determine the one rather than the other. In the portion of the inflamed part which is nearest to the vessels and nerves of the healthy tissues (that is, in the circumference) we have the effusion of fibrinous lymph, and consequently, the plastic result of inflammation: in that part, on the contrary, which is the furthest removed from healthy nerves and vessels, and towards which the passage of the blood must be most obstructed, as it has to reach it through a greater extent of inflamed tissue—(*i. e.* in the centre), we have the effusion of corpuscular lymph degenerating into the non-plastic product of inflammation—pus; thus exemplifying, or rather illustrating, the opinion of Hunter, that "the new-formed matter peculiar to suppuration, is a remove further from the nature of the blood than the matter formed by adhesive inflammation."

It may happen, however, that an abscess shall be formed by the softening, from the centre, of a part that has become indurated by inflammation; that is to say, throughout the whole of which fibrinous lymph has been deposited: showing that the fibrinous variety of inflammatory lymph may, under some circumstances, be converted into pus, though far less liable to that degeneration than is the corpuscular.

In the general softening and solution of the tissues, which take place in the formation of an abscess, the blood-vessels are destroyed like other textures, their truncated extremities being closed by coagulable lymph, whilst the capillaries of the adjoining part, which remain pervious, are seen to be dilated, and ramifying on the walls of the abscess. Whilst the inflammation continues the effusion of lymph continues also; and as this lymph is of a corpuscular character, it speedily undergoes a puriform degeneration, whence these vessels have been said to secrete pus; and the lining, or the inner surface of the abscess, has been called a pyogenic membrane, though there is in reality no membrane adapted to the special purpose of secreting pus. As the pus increases the abscess enlarges itself, generally in the direction of a neighbouring cutaneous or mucous surface; and as it approaches this, a feeling of fluctuation may be perceived, and when it reaches the inner surface of the integument, it is said to point; and if the abscess be not now opened by the lancet, the integuments ulcerate, and the pus is discharged.*

It is doubtful whether this extension of the abscess depends upon an interstitial absorption, the result of inflammation of the contiguous parts, or whether some of these parts are separated, and being cast loose, as it were, into the cavity of the abscess, soften down into pus. It is certain, however, that the tissues of the part are undergoing a process rendering them susceptible of interstitial absorption, since continuance of inflammation is essential to the progress of an abscess towards the part where it is about to open.

We may observe, that in order to the formation of an abscess, besides the formation of pus, a sufficient amount of fibrinous or plastic effusion is necessary to form the cyst or wall, and prevent the diffusion of the pus into the surrounding tissues. It does sometimes happen accordingly, in low inflammation in unhealthy subjects, through there being little or no fibrinous effusion from the part, that the corpuscular lymph rapidly degenerates into pus, constituting what is termed purulent infiltration. And when this occurs in the areolar tissue, the consequences are most disastrous; for there being nothing to oppose the diffusion of the pus, suppuration of an unhealthy character, attended with destruction by sloughing, of the part involved, spreads rapidly through an undefined extent of areolar

* Williams's 'Principles of Medicine.'

tissue. This has long been known by the name of diffused inflammation of the cellular membrane, and is attended by the greatest danger, the accompanying fever being of a low typhus character, and the extension of the mischief sometimes ceasing only with the life of the patient.

The opening of an abscess, if it be not effected by the lancet, has already been stated to take place by interstitial absorption and ulceration, of which it is necessary now to speak a little more particularly.

One of the most frequent effects of inflammation is a softening of the part affected, not only from its infiltration by fluid, but also from a tendency to disintegration, which may be regarded as an instance of degeneration during the inflammatory process; and, as Professor Paget observes, "a more general and more unmixed form of degeneration may be occasionally observed in the tissues of inflamed parts, viz., fatty degeneration; and this in such a manner as to make it probable that the degeneration takes place even during the inflammation."

Both these changes favour the removal by absorption of the inflamed part, constituting what we have before spoken of as, *interstitial absorption*, and which is to be distinguished from the ejection of particles from the surface occurring in what we now proceed to speak of under the term *ulceration.*

We have already seen that the effusion of pus is always attended with more or less absorption, not only of the effused fluid and of the lymph which encloses it, but also of the surrounding tissue; and, it not uncommonly happens, more especially in the advanced stages of inflammation, both that this process takes place in a degree greatly disproportioned to the effusion, and far beyond what is requisite for giving exit to the non-plastic product; and also that the superficial particles of the inflamed part are ejected externally—this is ulceration. It may occur, moreover, that the abscess has reached the surface, or has commenced very near it, or that a part of the tissue forming the surface—a mucous membrane for instance—has become the seat of inflammation and the superficial particles ejected, and thus a small open abscess, which is, in fact, an ulcer, is formed. We may thus have the process which has been described as going on in an abscess *towards* the surface taking place in an opposite direction, or *from* the surface; and in the more healthy forms of ulceration, there is a stroma or layer of fibrinous lymph deposited, which forms the cup or floor of the ulcer; and this stroma being continually removed, either by interstitial absorption, as in the case of the abscess, or ejected from the surface by the more strictly ulcerative process, is continually replaced by a deeper floor or cup, which is in its turn again removed: and this process may go on to any extent, removing in its course any tissue that may chance to traverse it, though some, as the walls of blood-vessels, are more slowly removed than others. This process is, however, as above described, preceded and attended by the effusion of lymph, which is being continually removed; and the more rapid is the absorption in proportion to the deposition, the more extensive and destructive is the ulceration. It may, however, happen that in some points the effusion of lymph takes place more rapidly than its absorption, and thus are formed those little eminences which quickly become organized and vascular, and are termed granulations. By the irregular growth of these granulations, and the irregular or varying extent of the ulcerative absorption, the surface of an ulcer is necessarily rendered uneven; and ultimately, its healing is effected, by the process of exudation of plastic lymph, and its consequent organization, prevailing over the contrary process of absorption; a result which, it must be apparent from what has already been said, can be brought about, only, by the suppression of the inflammation.

Thus far we perceive an exertion of plastic power for the purpose of repair, and that a wall of defence is being continually opposed to the destructive process, preventing the infiltration of pus into the surrounding tissues. It may happen, however, and not very rarely does, that there is not sufficient plastic power for this purpose, and the result is an ulcer without any cup or floor of lymph—this is the *phagedænic ulcer.*

Sometimes, again, the effused matter forming the cup of the ulcer becomes indurated, and there is very little effusion of lymph, and little or no granulation. Such an ulcer is not unaptly described by the term indolent; or—the granulations may be too large and soft; lymph, indeed, is effused in abundance, but it appears to be deficient in plastic property, probably from a preponderance of the corpuscular over the fibrinous form of exudation—this is the *spongy ulcer.*

There is still one step further in the destructive action of inflammation. This takes place when the increased vascular action attendant upon the first stage of inflammation is followed, or rather accompanied, by a rapid exhaustion of the vital force, so rapid, that it speedily ceases altogether, and the part dies—this is *gangrene.* It fortunately happens that this does not commonly take place throughout the whole inflamed tissue or organ, but that, that part which has been the most inflamed becomes soft and flabby, and then gradually changes its colour to a livid or black, and ultimately emits a putrid, cadaveric odour: this is more especially the case in that form of gangrene which is the direct result of inflammation: but when the mortification is of the character often termed dry gangrene, as from obstruction of an artery, or from the use of diseased grain, there is commonly no blackness or lividity. Mortification, or gangrene, occurs most often either on the surface or extremities of the body, in the lungs, in the mucous membrane of the alimentary canal (particularly the stomach and large intestines), and in the peritoneum, rarely in the other internal parts, except as the result of injury.

Gangrene has a tendency to diffuse itself through any part which is affected by it; fortunately, however, it generally happens where the inflammation has been less intense, or the living power greater, as in the part nearest the heart, that plastic lymph is thrown out, forming a stratum, or wall, by which the gangrenous structure is separated from the rest of the body; and, the affected part being separated from the surface of this layer, is said to come away by sloughing. When, indeed, the vital powers are very feeble, or the circumstances attending the infliction of the injury, which caused the inflammation, have been such as to give a powerful depressing shock to the system, there may not be sufficient power to produce this protecting wall of adhesive matter; and the gangrene, spreading rapidly, is arrested in its progress, only by the death of the patient.

The conditions which induce this most destructive result of inflammation, are those which most impair the living power of the part affected, or of the system at large. Among the former may be reckoned, violent mechanical injury, intense heat or cold, and certain poisons (among the latter, the morbid poisons of plague, typhus fever, scarlatina, erysipelas, &c.); affections of the heart or large vessels obstructing or enfeebling the circulation; and, of the nervous centres, impairing the vital powers; to these may be added, perhaps, the injudicious use of mercury, or other remedies which diminish the quantity of the fibrine, or lessen its coagulating property.

It may be observed that, as ulceration, like sloughing, consists (in a great degree, at least), of a separation *outwardly* of the diseased tissue, in contradistinction to, its being taken up, into the system, by the process which we have spoken of as interstitial absorption, it may be said to differ from the latter rather in degree than in kind: but there is this further distinction, that in ordinary ulceration, after the ulcer has been established, portions of the affected tissue cannot be recognized in the discharge from the ulcer; so that, in order to its removal, it must have previously undergone a molecular disintegration, or subdivision; though in the commencement of the process a visible slough is cast off: or, in other words, there is gangrene upon a small scale.

The disturbance caused by inflammation is not, however, confined to the part of which it is the seat; the blood throughout the system undergoes the changes which have been already described (p. 41); with the exception already noticed, that whereas at the seat of the inflammation, there is an increase in the proportion of the red corpuscles, they are diminished in the blood circulating through the system. The increase in the quantity of the fibrine always takes place when there is sufficient inflammation to give rise to febrile symptoms, although its actual percentage may be, in some degree, affected by the previous condition of the patient: thus, in typhus fever, the proportion of fibrine is always small, sometimes as low as 1 per 1,000; yet if, during this disease, inflammation be set up in any organ, the proportion of fibrine increases, though not to the same amount as under other circumstances, never reaching a higher proportion than 5 per 1,000, whereas in ordinary inflammations it almost always exceeds that amount, and, in some specific ones, as acute rheumatism, it reaches 8 per 1,000; so that we perceive the constant association of an increase of the quantity of the fibrine with acute inflammation, although there may be at the same time in operation other causes which have an opposite tendency.*

When, again, the system is weakened by any continued chronic disease, or if there be from any other cause a greater or less degree of anæmia, as in chlorosis; it will nevertheless happen that the fibrine will be increased under the influence of inflammation, and attain as high a proportion as in a subject previously healthy: neither is there anything in this contrary to what might have been expected; since, in such cases, the corpuscles alone are deficient, the fibrine varying scarcely at all from the normal standard: indeed, by reason of the constant deficiency of the red corpuscles, there must be, in anæmia, a relative excess in the proportion of the fibrine: so that, in chlorosis as well as in that state of anæmia which is induced towards the close of many protracted diseases, there must exist a condition of the blood approaching very closely to that which occurs in inflammation; a circumstance tending to explain, what clinical experience teaches by observation, that inflammation is very apt to supervene upon the state of anæmia.

In addition to these changes, there is always, in active inflammations of any extent, and in good constitutions, a general disturbance of the system, commencing most commonly with a feeling of chilliness and lassitude, with headache, and pains in the limbs, followed by, increased heat of surface, frequency and fulness of the pulse, thirst, a furred or a white, and, in the first instance, moist tongue, scanty and high-coloured urine, and sometimes, delirium. This general excitement is termed inflammatory fever.

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* Andral, 'Hæmatologie.'

This description of inflammatory fever is, however, strictly applicable only to healthy inflammation, occurring in the healthy subject, and as observed during its progress to its full development; its character being materially influenced by the stage and duration, as well as by the seat of the inflammation, and also by the age and condition of the patient.

Now the fever has been described as following the local inflammation, and as being brought about by the change in the condition of the blood, a change probably commencing in the inflamed part: this, however, is strictly true only of those inflammations which are set up by direct external injury; for there are many cases, those especially in which the inflammation is the effect of cold, where the general fever unquestionably precedes the local inflammation, and that, too, in parts exposed to view, as the tonsils and mammæ, in which the commencement of the inflammation could not easily have been overlooked. There are again, undoubtedly, many inflammations which are the effect of poisons introduced into the system, which poisons (as in the case of small-pox) often evince a remarkable tendency to reproduce and localize themselves in particular parts or tissues. This is more especially the case of animal and morbid poisons, and in such cases, since the poison must have been present in the blood before giving rise to the local inflammation, we need be at no loss to account for the antecedent febrile disturbance; and others, although not capable of reproducing themselves like the specific morbid poisons, evince a no less remarkable tendency to localize their effects upon particular tissues,—as in the case of arsenic, applied to an abraded surface, creating inflammation of the stomach,—though we are at present unable to explain the manner in which this peculiar determination is effected. And to take the case of cold applied to the surface, we know that even in this instance there must be an alteration in the secretion, circulation, and nutrition of the skin; and as such alteration, whether in the secretion or nutrition, cannot take place without a corresponding change in the condition of the blood, (brought about by the presence in that fluid of materials destined for the supply of the nutrition or secretion of the part whose functions have been thus interfered with,) there may be thus induced a state of the blood capable at the same time of exciting general disturbance in the system, and ultimately inducing inflammation, by the abnormal matter localizing itself, and exciting irritation in any particular part.* This, perhaps, is the way in which we may explain the fact of the general fever sometimes manifesting itself before the local inflammation.

The character of the fever is, as we have said, modified by the period of the local inflammation, and, after some of the consequences of the latter, above described, have been established, it undergoes a material change; the nature of which depends, in many instances, upon the organ affected, and will be described in connexion with the special inflammations; but the very striking and common change, from the continued to the remitting character of fever, belongs especially to a particular stage. This form of fever is the hectic, which is generally associated with the formation of pus, and accompanies the process of suppuration or ulceration. Its commencement is often marked by a distinct and severe attack of rigors, after which the fever becomes remittent. There are often chills in the afternoon, which are followed in the evening by heat of skin,—great flushings in the face, often with a remarkable pink patch in the cheeks,—thirst,—anorexia,—and furred tongue: as night advances, the patient perhaps falls asleep, and awakes early in the morning bathed in perspiration; this is accompanied by a sense of great languor, and followed by an abatement of the fever, which returns in a similar manner in the afternoon; the pulse, however, continuing frequent throughout. There are sometimes two or three paroxysms during the twenty-four hours, and it is worthy of note, that the paroxysms and remissions may take place still more irregularly, consisting, in some instances, merely of frequent flushings. This, perhaps, oftenest occurs when the effused inflammatory product has been gradually undergoing a transition to the puriform character. When the hectic continues, which it generally does unless the suppurating part be healed, debility and emaciation steadily increase—the tongue becomes vividly red and glazed, and subsequently it, as well as the lining membrane of the fauces, is covered with little points of suppuration, termed aphthæ—diarrhœa, with increased exhaustion, succeeds; and the patient sinks, though in general with but little or no delirium or sensorial disturbance, till the very last.

Sometimes, again, the change in the character of the fever is of a different nature, arising from its assuming more of the low, powerless type, denominated typhoid. This is marked by a brown and dry tongue, dusky skin, feeble and incompressible pulse, and, in bad cases, low, muttering delirium. But, whichever be the nature of the change in the character of the fever, it is of the greatest importance to observe it; since, if there be evidence from other sources of the continuance of the inflammation (or rather, if there be no satisfactory evidence of its subsidence), it indicates a change from the plastic process of adhesive inflammation to the destructive one of suppuration, or ulceration, a change which calls imperatively for an alteration in our remedial measures.

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* Those who have ever considered the minute exactness which must exist, in health, between the blood and the tissues, will not be surprised that any, even the most minute, alteration of this adaptation, may become a source of disease, or that the abnormal matter or diseased action should localize itself in any particular part or tissue.—*Vide* Paget on Nutrition, 'Med. Gazette,' 1841; 'Brit. and For. Med. Chir. Rev.' vi. p. 406; and Dr. W. Budd on Symmetrical Diseases, 'Med. Chir. Trans.' xxv. p. 100.

A still more formidable type of inflammatory fever presents itself in the "irritative fever" of Travers and earlier authors—that which is now generally recognized as associated with the absorption, into the system, of a morbid poison generated in the seat of unhealthy suppuration. This inquination of the blood has been variously designated by the terms puriform infection, pyæmia, and (more lately by Dr. Hughes Bennett) ichoræmia. The two first terms were perhaps employed, in the first instance, under a belief that the pus was absorbed by the veins at the seat of suppuration, and so carried into the general circulation,—an opinion which seemed, at first sight, to derive confirmation from the fact that deposits of pus were frequently found in the liver and in the lungs. It cannot, however, be supposed that the mere presence of pus globules in the blood would be sufficient to produce the disastrous symptoms attendant upon this form of inflammatory fever, since it has been ascertained that pus (healthy pus, that is) may be injected into the veins with impunity. Hence we should infer that the poison differs from pus, though it is formed in the process of suppuration. The term ichoræmia is therefore perhaps etymologically more correct than either of the others, though they have now been so far sanctioned by custom that they may be freely used to designate a certain state of system, without conveying the belief that that state is dependent simply upon the presence of pus in the general circulation. This form of blood poison is generally associated with traumatic inflammation, more particularly when consequent upon injury involving bone, and most frequently with sloughing, consequent upon it. The symptoms are, rigors, fever, with great prostration, anxiety, a red and brown tongue, a dingy or yellowish hue of the skin, with livid, purpurous spots, in some instances, and a peculiar odour of the breath. These symptoms, however, sometimes arise independently of any wound or appreciable suppuration: and when occurring in this idiopathic form, are more dangerous, if possible, than when they arise from any appreciable local suppuration.

The character and symptoms of inflammatory fever are also materially influenced by the age and constitution of the patient. Thus in persons of advanced age, or of constitutions impaired by bad or intemperate living, the fever will often be of the low or typhoid type, and there will be, almost from the first, a brownish tongue, feeble compressible pulse, and generally prostrate condition of the system. Whereas in the younger and more robust we shall have a greater hardness of the pulse, with a dry tongue, and greater heat of surface; and these symptoms of active fever will often be observed to persist after the more urgent ones of the local disease have begun to subside.

The febrile symptoms are still further modified by the seat of the disease. Inflammation of the tonsils and of the serous and synovial membranes, is attended with a more active fever than that of the parenchymatous viscera, and inflammation of the latter than that of the mucous surfaces. Inflammations of the brain, of the pericardium, and of the intestines, produce remarkable modifications of the pulse, to be noticed hereafter.

In taking a review of the inflammatory process, it may be important for practical purposes to make a few observations upon the effects which it produces upon the living powers.

Now, as regards the part itself which is the seat of the inflammation, it may be remarked, that the term increased action, so freely used by writers upon this subject, must be taken in a very qualified or restricted sense; for though there is, while the inflammation lasts, an increased afflux or determination of blood to the part, there is no increase of the vital process of nutrition; on the contrary, so far from there being any hypertrophy or increased formation of the natural tissues of the inflamed part, we have an opposite tendency; the tissues waste, or become soft, relaxed, and weakened; they degenerate, and are lowered in functional power, or become absorbed; they die and are cast out from the system.

We perceive then that as regards the part itself the effect of inflammation is rather to depress than to exalt its vitality; and the same may perhaps be said of the attendant fever, upon the system at large; whilst this fever lasts the waste of the body often goes on with increased rapidity, and its nutrition being checked, its renewal is arrested until the inflammation has subsided.

As regards, however, the products of the inflammation, or the new matter which is generated in and around the inflamed part, we often have, indeed, an increase in bulk and weight; but as regards this new matter it should be remembered, that even when it becomes organized, no other tissues are ever produced but those which are lowest in the scale of vitality, viz., bone and areolar tissue; and that the effused lymph cannot assume even this degree of organization, until the inflammation has subsided; whereas, if it be excessive, or very long continued, the organization is ultimately entirely frustrated.

The immediate or proximate causes of inflammation must be sought for in the disturbance of those conditions essential to healthy nutrition, of which we have seen inflammation to be a perversion, although it may be doubted if each, or even any of these is capable of singly producing inflammation. Thus changes in the blood-vessels affecting the free transit of blood through them, are capable of producing an imitation of some of the phenomena of inflammation, as in the effusion of liquor sanguinis, which sometimes assumes the form of inflammatory lymph, and undergoes partial organization; but, beyond this, we do not find that simple distention of the blood-vessels, such as that produced by mechanical obstruction, is capable of alone producing the phenomena of inflammation.

Changed condition of the blood itself has undoubtedly a more certain tendency to produce inflammation, than has that of the blood-vessels; and it is highly probable that the majority of the so-called constitutional or idiopathic inflammations have their origin in the blood. This we know to be the case in the eruptive fevers, where the presence of a morbid matter may be proved by their communicability by inoculation; and though it may not have been actually demonstrated, there can be little doubt that the same is the case with rheumatism, gout, erysipelas, eczema, and similar affections generally called constitutional.

As regards the due influence of the nervous force, we have seen instances already adduced that its disturbance may excite inflammation, and more will probably be mentioned hereafter: at the same time there is no reason for adopting the hypothesis that the phenomena of inflammation are brought about solely through the medium of nervous influences, since they may be excited in parts that have no nerves.

As the nutrition of a part is maintained by the mutual interaction of the blood and the tissues of that part, it must follow that an altered condition of the part itself must interfere with its healthy nutrition, and therefore we might expect, from analogy, that the phenomena of inflammation might arise from the same cause, the more so as we know that "it is the state of an injured part, or of its proper tissues, not of its nerves and vessels, which determines the process of reparation; and some of the processes of repair are so like those of inflammation, that they are commonly identified, and are, perhaps, not capable of even a refined distinction.*

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* Paget, 'Lectures on Inflammation.'

V.

SIGNS OF INFLAMMATION, AND OF DISEASE IN GENERAL.

The *symptoms of inflammation* require to be treated of in this place, although some of the remarks which we shall have occasion to make will be equally applicable to those of disease in general. They have been commonly described as local and general; but there exist some objections to this arrangement, inasmuch as the so-called local signs are often not seated in the part affected, but, on the contrary, manifest themselves in others remote from it; nor indeed are they always confined to any fixed part, since the derangement produced by the impaired function, consequent upon the disease of a vital organ, must be perceptible over the whole of the system. We therefore prefer to class them, as

I. Primary and local.
II. Secondary and sympathetic.
III. General and febrile.

(1). When the inflammation (or other disease) is seated in external parts, the local symptoms are so obvious as to require no description.

It is when there exists deep-seated inflammation, more especially in any of the great cavities of the body, that there often arises considerable difficulty not only in determining its seat but in ascertaining its existence; and this difficulty constitutes one of those problems the solution of which is the special province of the practice of medicine. I. The primary and local signs of inflammation consist in the alterations in the sensibility and physical condition of the part, and in derangement of its functions. II. The secondary consist in derangement of the sensations or functions of remote parts. III. The general and febrile are the inflammatory, irritative, and hectic fevers already described. It is to the first of these that our attention is directed by the definition of internal inflammation given by Cullen, viz., "fever with *fixed pain* in some internal part, and *deranged functions in some internal organ.*" Now as regards the pain, though it is almost always the first symptom to which our attention is directed, and often one of the most urgent; yet it is perhaps the most fallacious of the signs of inflammation, for not only does it vary very greatly according to the structure of the part inflamed, independently of the intensity of the inflammation, but besides this, we may have severe pain without inflammation, and inflammation of an intense and dangerous character without pain. Thus pain is severe in inflammation of the serous membranes (with the exception, perhaps, of the pericardium and lining membrane of the heart and arteries, ; less so in inflammation of the mucous membranes; and so slight, or so frequently altogether absent, in inflammations of the parenchymata of the viscera as to render it possible that when present it is dependent upon the implication, of some membranous stricture, in the inflammation. The pain also resulting from slight inflammation of the walls of the great cavities, as well as neuralgic pains, independent of any inflammation, may often equal in intensity that arising from the most acute.

There is, however, another modification in the sensations of the part from which we may, where it is applicable, often learn as much or even more than from pain, and that is tenderness. It is very true that there may be an exalted sensibility, especially of the surface, without any inflammation, as in the case of the tenderness of the integuments in the early stages of continued fever, and of that which sometimes accompanies neuralgic pains in irritable subjects; it may also be present as a peripheral manifestation of some inflammation or irritation of the nervous centres, the brain, and the spinal cord. Still, where it is possible to apply pressure to a deep-seated part, as in the case of the abdominal viscera, the tenderness so detected may, in connection with other symptoms, be a great help to us in determining the existence or seat of the disease, and afterwards in estimating its progress. This is particularly applicable to inflammation of the mucous membrane of the intestines, where the pain complained of may be very slight, although upon cautious and deep-seated pressure there may often be found to be considerable tenderness: the same holds good also in some degree in inflammation of the liver, kidneys, and bladder. In inflammation of the peritoneum it affords great assistance in determining its extent and progress. Caution, however, should always be observed, that, in making pressure, to ascertain the presence or absence of this symptom, we do not inflict injury upon parts rendered more than usually susceptible of it by disease.

There is again another way in which this tenderness manifests itself; and that is, in the impediment it causes to the movement of parts connected with the seat of the inflammation, or the pain which it causes by their being brought into certain positions relatively to it. Thus when the larynx is inflamed, we have often difficulty in deglutition or swallowing; when the pleura, a deep inspiration or cough causes pain; and the same is the case in inflammation of the peritoneum, owing to the tenderness of the inflamed membrane being excited by the descent of the diaphragm, the respiration being at the same time rendered thoracic; this latter symptom is also not uncommonly present, from a similar cause, in inflammation of the pericardium.

In addition to the signs which may be derived from the feelings of the patient, are those presented to the senses of the observer; and where these can be applied, which, owing to comparatively recent improvements in the art of diagnosis, they now can be to a much greater extent than formerly, they become of more importance than the preceding. The most obvious instances of change in the sensible properties of a part, are the redness, heat, and swelling which may be seen or felt in parts which are immediately accessible to the sight or touch. But it is not only by the senses of sight and feeling that we are enabled to detect changes in the size or consistency of internal parts: the sense of hearing will be found most materially to aid us, and that too in parts situate within the bony walls of the chest, and consequently inaccessible to the touch. Thus when the lungs are rendered more dense from the plastic effusion of inflammation, the sound elicited by striking the surface overlying the inflamed part will be duller than it would have been in health: a similar result, though from a different cause, is produced when inflammation of the pleura has given rise to effusion into the cavity of that membrane; and even in the abdomen, where we can in some measure apply the sense of touch, the variations in the resonance will greatly aid us in detecting enlargements and effusions, whether inflammatory or otherwise.

But besides this, the senses of the observer may be applied to detect the alterations which are produced, by inflammation, in the sensible phenomena which accompany the action of those parts. Thus not only do inflammations of the heart and large arteries make the pulsations violent and irregular, but the sounds accompanying them are greatly altered from what they are in health. Again, in inflammations of the lungs, air-passages, or pleuræ, not only is the respiration quickened, and in some cases rendered painful; but the sounds, which accompany, breathing, coughing' or speaking, as heard by listening on the surface of the chest, are essentially different, according as one or other of these structures is affected, and according to the extent and stage of the inflammation.

Another sign of disease, and one which is, perhaps, of greater importance than any of the preceding, is the impaired or perverted function of the part or organ. Inflammation of the nervous centres may give rise to disturbances in the intellectual, sensorial, or voluntary functions, consisting of delirium, excessive sensibility, loss of sensation, increased mobility or spasm, and loss of voluntary motion. In inflammation of the lungs we may have not only the hurried and altered respiration before alluded to, but also a defect in the special function of those organs, namely, the decarbonization of the blood ; hence the dusky hue of pneumonia. When the liver or the kidneys are inflamed, we may have suppression or diminution in the secretion of bile or urine ; or in the latter case, the presence of some of the ingredients of the blood in the secretion. Or the disturbance of the function of the part, the *læsa partis functio*, may evince itself in an alteration or perversion of its automatic movements ; as, in vomiting from inflammation of the stomach ; and, in constipation or diarrhœa according to the tissue involved, in inflammation of the bowels.

It must, however, be remembered, that, in the case of several organs, the integrity of the whole of which is not essential to the due performance of their functions, those functions may be carried on notwithstanding the inflammation of a considerable portion. Thus there may be, and not unfrequently is, considerable inflammation of the lungs without any perceptible embarrassment of the breathing, especially when the whole quantity of blood is reduced by long-continued disease, and therefore the quantity requiring to be arterialized in the lungs is diminished. So also there may be inflammation of a portion of the liver whilst the secretion of bile is actively carried on by the part which remains free from disease.

II. Again, we may have symptoms showing themselves in parts distinct from that which is the seat of the disease.

Of these, one class may be termed secondary, as when the functions of one organ are impaired by inflammation of another. Thus the functions of the brain may be disturbed by inflammation of the bronchiæ, the lungs, the liver, or the kidneys, owing to the depuration of the blood by the affected organ being checked or arrested. The liver is often gorged, and its secretion diminished in extensive inflammation of the lungs or bronchia. The secretion from the kidneys is greatly altered in inflammation of the liver, and it is probable that the pungent heat observed in pneumonia is a phenomenon of the same description.

But perhaps the greater number of the symptoms show themselves at a distance from the seat of the inflammation. These are divided by Dr. Alison into sympathetic sensations and sympathetic actions. They are in all probability, the latter more particularly, the result of a sensation or action excited at the extremity of the reflected nerve, by irritation of the incident one.

Of the first kind are the pain along the spine of the back, or in the extremities, accompanying inflammation of the brain; pain around the trunk, arising from inflammation of the spinal chord; pain in the right shoulder, from inflammation of the liver; pain across the epigastrium, from inflammation of the kidneys; pain down the course of various nerves, from the pressure of an aneurism; pain at the extremity of the urethra, from irritation of the lining membrane of the bladder.

Of the sympathetic actions are the vomiting which attends inflammation of the brain, liver, kidneys, or uterus, and in some measure that which is excited by inflammation of the stomach itself, since in the latter case as well as the former the action of the diaphragm and abdominal muscles is sympathetic, being an action, in the part supplied by the reflected motor nerves, excited by irritation at the extremity of the incident nerve. Again, in inflammation of the Schneiderian membrane there is sneezing; and of the lining membrane of the larynx and bronchi cough; of the colon tenesmus, of the bladder stranguary, or incontinence of urine.

III. Of the general and febrile signs of inflammation we have, in the first place, the inflammatory fever already described.

Of the general symptoms of inflammation, as well as of all diseases, there is none more important than the pulse, which, rightly interpreted, will afford great assistance, not only to diagnosis, in the more ordinary sense of the term, but also, towards estimating the general condition and powers of the patient, often of more importance as a guide to our treatment, than the detection of any special local disease. In order, however, to render the examination of the pulse available for these purposes, we must have tolerably clear notions concerning the conditions requisite for the production of a healthy pulse.

We must have (1,) a healthy condition of the heart itself, which is the first moving power of the circulation; (2,) a healthy condition of the orifice of the aorta, including its valves, and, of the large arteries; (3,) there must be a free current of the blood through the capillaries and veins to the right side of the heart; (4,) a free passage through the pulmonic circulation; (5,) a due supply of nervous influence.

(1.) By a healthy condition of the heart is meant that it is both structurally and functionally healthy, and that it receives a due supply of healthy blood. The heart may be deranged as a piece of mechanism, and a corresponding alteration in the force and regularity of its action will ensue: thus its muscular walls may be too thick and strong, which, if there be no obstruction, will give a corresponding force to the impulse as felt by the finger upon the radial artery, and the pulse will be hard or very full, but generally the former, according as the resistance of the coats of the artery is increased or diminished. The ventricle may, however, upon the other hand, be thin, or weak, from degeneration, and in this case, the pulse will be feeble and small, from the scanty jet thrown into the artery at each systole; and, as a necessary consequence, the ventricle not wholly emptying itself, it will be continually excited to contract, by the constant presence of blood in its cavity, and therefore the number will be increased, or, in other words, the pulse will be rapid as well as small and feeble. A very feeble state of the ventricular parietes may also, by causing delay in the circulation, give rise to irregular or intermittent pulse, in the manner to be presently noticed. Again, as a mechanical condition, the mitral valve may be imperfect, in which case, the blood regurgitating into the auricle, the quantity thrown into the aorta must be diminished, and the pulse will be small; or owing to the left ventricle not receiving a regular supply of its natural stimulus, the blood, its contractions, and consequently the pulse, will be irregular. It may here be well to observe that independently of lesions of innervation, the chief, if not the only cause of intermittent pulse is a want of a due supply of blood to the left ventricle: this may happen in two ways—either the current flowing into it may be considerably diminished, as in the case of a narrowed mitral orifice; or the cavity of the ventricle may have become enlarged by dilatation, and the quantity of blood required to excite regular contraction increased; in which case any obstruction tergal to the ventricle, or diminution in the activity of the circulation, will induce intermission.

(2.) Passing from the left ventricle to the orifice of the aorta we observe, that if this orifice be narrowed, the jet into the aorta must be diminished, and therefore the pulse small in comparison with the impulse of the heart. If, on the other hand, the valves of the aorta be imperfect, we may have a sufficient quantity of blood thrown into that vessel with each contraction of the ventricle; but, a portion of it regurgitating by the elasticity of the artery, the current of the blood will not be continuous, and therefore, although the pulse may at first be felt sharp and full, it immediately subsides, conveying to the finger, the impression of a splash, with a recoil, rather than of an undulating current passing underneath it; this is what has been termed the "splashing" or "water-hammer" pulse.

There is another character of pulse which is sometimes imparted to it by disease about the aortic orifice, namely, the *thrill*. This may be felt when the current has been split or disturbed by anything projecting into it or drawn across it, or when there is a warty excrescence upon one of the semilunar valves; or when its free margin has become tense, and its curtain perforated. This thrill at the radial artery is excited by the same cause as the so-called musical murmur over the orifice of the aorta, and may be accompanied by it. As, however, the thrill may be produced by nervous excitement, an anæmic condition, and other causes, it must not be regarded as pathognomonic, but merely as calling for careful investigation of the condition of the heart.

In order, however, that the current of blood may be well sustained and uniform, instead of splashing or jerking, we must have not only the aortic valves—the *point d'appui*, perfect; but the elastic force of the large arteries which acts upon it must be perfect likewise; and therefore when this is greatly impaired, as it not uncommonly is, we shall have a splash in the pulse not unlike that produced by defective valves.

The character of the pulse at the wrist is again materially influenced by the condition of the systemic arteries generally, of which the radial, in the ordinary mode of examination, may be taken as the representative. If the contractility of the artery be diminished the pulse will be soft, and if it be increased the pulse will be hard.

It may be as well here to remark that, assuming the valves and large arteries to be healthy, the character of the pulse at the wrist is determined by the force of the ventricular systole and the contractility of the radial artery: thus, if the heart be acting with increased force, the pulse at the wrist will become fuller; but if to this condition there be added increased contractility of the arteries, which appears to be the case in active inflammation of most organs, we have the pulse increased in hardness as well as fulness; if again, as sometimes happens, inflammation depresses the action of the heart, which appears to be the case when it affects structures in the neighbourhood of the solar plexus; the injecting force being small, but the inflammatory contractility of the artery remaining, we have the small hard, thready, or wiry pulse.

There is another state of the pulse at the wrist which deserves special notice, as it is apt to be confounded with the hard pulse of inflammation, and that is, an increased thickness or rigidity of the artery depending upon chronic change in the coats of the vessel—the effect commonly of advanced age, decreased viscera, intemperance, or hard labour. This gives to the pulse an appearance of hardness or incompressibility which is not real, since by moderate pressure the artery may be emptied of its contents, although it may itself be still felt like a smooth, or sometimes rather knotted, rolling cord under the finger. Under such circumstances the artery will generally be tortuous; this tortuosity varying with each stroke of the heart gives a movement to the artery, which it has been proposed to describe by the term "locomotive pulse."

(3.) We come next to the extreme or capillary circulation. It is evident that the character of the pulse at the wrist must be influenced by any obstacle to the circulation beyond it, or more removed from the heart, as certainly, though perhaps not so directly and obviously, as by one nearer to the centre of circulation. Consequently when there is delay in the transit of blood through the extreme circulation, as happens in blood-diseases and fevers, where it is obstructed by the diminished affinity between the blood and the tissues; or where there is mechanical obstruction to the return of the blood through the veins; the pulse will be rather sharp and soft from the ready dilatation of the artery, and will generally have a slight recoil or back stroke, often observed in fevers. But, when this obstruction has existed for some time, the circulation will become languid, from the loss of the natural stimulus in the extreme circulation, and the pulse will become very feeble.

Obstructed venous circulation will, as has just been shown, produce changes in the pulse similar to those arising from capillary obstruction from other causes: and we shall have under such circumstances the pulse at first rather sharp, and with a slight back stroke, and becoming, as the disease advances, more and more feeble, especially in comparison with the impulse of the heart; that impulse being not unfrequently excessive, owing to the distended condition of the right ventricle, which is very generally associated with venous congestion. It must be borne in mind, too, that the character of the pulse, especially as regards its regularity, is often modified by the nature of the disease producing the congestion, as in the instance of valvular disease of the heart.

(4.) We come now to the right side of the heart, and pulmonic circulation, obstruction in any part of which will produce effects upon the systemic circulation, and consequently upon the pulse, similar to those referred to venous congestion, but will also, by more directly influencing the supply of blood to the left side of the heart, tend to cause irregularities in the pulse, to be presently noticed.

It should be observed, also, that by obstructed pulmonic circulation we do not mean, only, mechanical obstruction; but also, whatever interferes with the free approximation of the blood to the air, in the pulmonary cells, and consequently impedes the action of the mutual affinity between them, which is one of the moving powers of that system.

Obstructed pulmonic circulation also impedes the return of the blood to the left side of the heart, and therefore influences the pulse, as regards its regularity, as much as does narrowness of the left auriculo-ventricular orifice; thus sudden effusion, or dyspnœa, from any cause, as, for instance, dilated cells, or chronic bronchitis, will render the pulse either very small or intermittent, the former generally if the left ventricle be not above the ordinary capacity, but if it have been previously dilated, the diminished supply of blood will then cause irregularity or intermission.

Besides the due supply of blood in point of quantity, the action of the heart and arteries, and consequently the character of the pulse, is materially influenced by its quality, although it is by no means certain whether this influence be exercised *directly*, or through the medium of the nervous system. Thus anæmic blood, or blood deficient in red corpuscles, causes a hurried action of the heart; and is generally associated with a diminished contractility of the arteries, giving to the pulse a sharpness, but at the same time want of persistance, closely resembling the splashing pulse of defective aortic valves. Blood also which is charged with retained secretion through disease of the depurating organs, may act directly as an excitant to the heart; or indirectly as a sedative, by producing a tendency to coma, through the nervous system.

(5.) Another condition requisite to the regular action of the heart is a due supply of nervous influence; and, although that supply is derived mainly from the ganglionic system, yet we know from experiment, and from the phenomena of disease, that lesion of the brain and upper part of the spinal cord will materially affect the action of the heart; generally in the way of depressing it; and that, when this injury takes place very suddenly, suspension of the heart's action, and consequent death from syncope may ensue. In more chronic cases, however, disease about the medulla oblongata, and cervical portion of the medulla spinalis, will generally be attended by a slow, or intermittent pulse; and it is probably on this account that dyspepsia, and other diseases associated with irritation about the extremities of nerves proceeding from that part of the brain and spinal cord, are often attended with irregular or intermittent pulse.

We have already alluded to several circumstances which affect the rapidity of the pulse, though but little has been said of quickness or slowness as distinct characters. The standard frequency of the pulse, in the adult male, may be stated as 72; in the female somewhat more: in infancy and childhood the pulse is more frequent, being about 120 for a child of one year old, and about 100 for a child of seven years; in advanced life, the frequency of the pulse generally diminishes. There may, however, be great difference in the frequency in different individuals without any evidence of disease: thus, some persons have habitually a pulse of 90, or even 100; whereas others, who have attained to a great age, have been known for many years before death to have had a pulse as low as 40, or even less, and to have been in otherwise good health. The above numbers are supposed to be observed in the sitting posture, as the frequency of the pulse varies in different positions of the body. Thus, if the pulse be 64 in a minute in the recumbent posture, it will be about 74 in the erect; the number when the patient is sitting being nearly a mean between the two: the difference between the recumbent and erect pulse increases with the frequency, and may be stated generally at about 10 per cent. of the recumbent pulse. This rule is, however, liable to great exceptions in disease, and, barring organic disease of the organs of circulation, it may be stated generally, that the difference is the greatest in cases of extreme debility. Dr. Graves has given the following results of a great number of observations made in different diseases, from which, however, hypertrophy and dilatation of the heart were excepted :—

(1.) The greatest difference occurs in patients labouring under fever, or in a debilitated state in consequence of fever, or any other cause. It may amount to 30, 40, or even 50, between the horizontal and erect postures.

(2.) This difference decreases after the first quarter of an hour, in most cases, but always remains considerable, as long as the same position is observed.

(3.) In persons not much debilitated, this difference is much less than that stated above, and often does not amount to much more than 10.

(4.) When the patient lies down, the pulse rapidly falls to its former standard.

(5.) In some the increase in frequency is greater between the horizontal and sitting posture, than between the latter and the erect, while in others the contrary takes place ; so that, generally, the frequency in the sitting posture may be taken as a mean.

(6.) In persons convalescent from fever or acute diseases, it is extremely useful to ascertain the comparative frequency of pulse in the horizontal and the erect position.* The greater the difference, the greater is the debility in the patient, particularly if the pulse, on his lying down, does not resume its usual degree of frequency.

In disease of the heart, however, there is often a remarkable exception to the above rules,—the pulse maintaining the same frequency in each posture ; and this is more particularly the case when there is great hypertrophy, with dilatation.

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* This applies particularly to the acceleration on rising from the recumbent position.

In order to make the foregoing remarks more directly available for the purposes of diagnosis, we may regard the pulse as characterised by—

(1.) Its force.

(2.) Its degree of compressibility, which includes the condition described by the terms—*hard*—or *soft*.

(3.) Its volume.

(4.) Its distinctness; a condition which has, perhaps, not been sufficiently noticed by the generality of practitioners, but which, as may be inferred from what has been already said (p. 70), depends primarily upon the force and regularity of the systole of the heart; and, secondly, upon the free transmission of the blood through the extreme circulation; the feeble and undulating pulse, in some cases, and the recoiling or dicrotous pulse in others, being often indications of capillary obstruction.

(5.) Its rhythm, or regularity.

(6.) Its frequency, which will depend upon the nervous irritability of the heart, and the amount of its natural stimulus, to wit, the blood which it receives. It is increased—by nervous excitement, as mental emotion—by muscular exertion, which hastens the return of the blood to the heart along the veins—by inflammation, which acts partly in the same way, though partly also through the influence of the nerves—by obstructed circulation, which, by opposing the current of the blood from the heart, prevents its freely emptying itself, and thereby keeps it continually under the influence of the stimulus of distension—by debility, unless there be perfect freedom of the capillary circulation—by the febrile state, in which several of the above conditions may be supposed to be combined.

It may readily be conceived, that as each of these conditions is independent of the others, we may have them differently combined, so as to produce almost endless varieties in the pulse: this is so nearly what occurs in practice, that it would be, more than difficult, to specify every possible character of the pulse, so as to attach to each its diagnostic significance; we will therefore merely take, by way of illustration, one or two conditions, in order to point out, how they may be interpreted, by their combination with others.

The pulse may have considerable force—this will indicate strong contraction of the left ventricle, which may arise from increased excitement, or from hypertrophy. Now one of the most frequent causes of excitement of the heart is inflammation; but, associated with inflammation, there is generally an increase in the contractility of the arteries—this will render the pulse hard as well as forcible; such is the general character of the pulse in inflammation, with the exception, that in inflammation of some tissues as the mucous membranes, the contractility of the arteries seems but little affected, and, accordingly, we have a sharp, but not hard, that is to say, a compressible pulse. In other inflammations, again, affecting structures in the neighbourhood of the solar plexus, the force of the heart's action is diminished, but the contractility of the artery remains, and we have the small and hard, that is to say the wiry pulse.

The force of the pulse is also influenced by the condition of the left ventricle; if this be large, and its walls thick, we shall have a corresponding force and volume in the pulse: this is often counteracted by an increased thickness in the coats of the artery, giving to the pulse a considerable degree of hardness; and when this state of the artery is far advanced, there is given to it a tortuosity, which, undergoing a change at each contraction of the heart, gives rise to the movement that has been rather whimsically described as the—locomotive pulse.

The splashing pulse, another modification of the forcible and full pulse, is caused by hypertrophy, when the continuous current of the blood is not maintained, owing to regurgitation through the aortic valves: the same thing happens, though in rather a less marked degree, when the elasticity of the large arterial trunks is destroyed by disease, or that of the whole arterial system greatly diminished by excessive hæmorrhage.

Smallness, or feebleness of the pulse, indicates a corresponding feebleness in the action of the left ventricle, and is still more characteristic when the pulse is at the same time soft, which shows that its smallness is not owing to any increased contractility in the artery. This diminished action may arise from debility of the system in general, or of the heart itself, or from a diminished supply of blood to the left ventricle, as in obstructed circulation through the lungs. It may also be caused by general capillary obstruction, as in blood diseases, the central moving power gradually failing in its action, when the natural stimulus of the extreme circulation,—the affinity between the blood and tissues—is withdrawn. Preceding this feebleness of the pulse in blood diseases, there will often be a full, soft, but rather jerking pulse, not very dissimilar to the splashing, produced by an increased effort of the heart to overcome the peripheral obstruction, the contractility of the artery being at the same time less than in health; or, in other cases, such obstruction may cause a slight back stroke, which is the dicrotous pulse.

The conditions requisite for the regularity of the pulse have been explained to be—a uniform current of blood to the left ventricle, and a due supply of nervous influence. Intermittent pulse does not therefore, as has sometimes been stated, necessarily indicate valvular disease of the heart, but some circumstance tending to interfere with either of the above conditions. Amongst those which impede the due supply of the left ventricle, may be reckoned, disease of the right side of the heart and pulmonary artery, disease of the lungs and their appendages impeding the pulmonic circulation, and disease of the left auriculo-ventricular orifice. Irregular or intermittent pulse also occurs when the muscular walls of the heart are degenerated or attenuated; though probably as the result of the pulmonic congestion always attendant upon such a condition. When the pulse becomes intermittent from any of these causes, it is almost always at the same time very feeble or indistinct. Circumstances may, however, arise which may prevent the pulse becoming irregular notwithstanding the presence of some of the conditions just described. Intermittent pulse may also be the effect of disease of certain portions of the nervous system; or (through the medium of the nerves) of the digestive organs. When there is no evidence of gastric disturbance, or any other disease by which it may be explained, *it is a threatening symptom, as regards the brain; and under such circumstances, the patient should be carefully watched.*

Next to the pulse, the tongue presents us with the most important, of the signs of general and febrile disease, as well as, in many cases, of affections of particular organs; though it is with the former that we are now more immediately concerned, since its connection with special diseases will be more conveniently stated when we come to treat of them separately.

"The mode of protruding, of holding out, and of withdrawing the tongue is," as Dr. Copland observes, "always deserving of attention. It is protruded with difficulty in comatose and paralytic cases, and also when there is great prostration from whatever cause arising. It may sometimes not be protruded at all, either from insensibility to the command to do so, or from inability to comply with it: this also indicates loss of sensorial or muscular power. The tongue may appear increased or diminished in size in different diseases, independently of local disease of that organ itself; it is enlarged by a secondary or consecutive inflammation of the organ, occurring as a complication, of angina, of scarlet fever, of small-pox, of hysteria, epilepsy, syphilis, and as a consequence of mercurial action, or of poisons." * A broad, flabby tongue, indented by the teeth, or a fissured and sulcated, as well as enlarged one, is seen in mercurial action, and also in disorder of the digestive organs with debility, and in connection with hepatic derangement. A tumid and livid tongue is indicative of disease in the heart or lungs, obstructing the pulmonic circulation, and interfering with the aëration of the blood; if it be, moreover, covered with a cream-like mucus, it shows that there is at the same time irritation of the mucous membranes.

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* Copland, 'Dictionary of Practical Medicine:' Art. Symptomatology.

The tongue appears small, often narrow and pointed in low fevers, and in gastric irritation; also in irritation of the membranes of the brain, especially if it be at the same time red at the tip and edges.

The moisture of the tongue is produced mainly by the salivary secretion poured into the mouth, to which may be added the exhalations from the mucous lining of the mouth and fauces: the presence or absence of this moisture is of great significance in regard to the state of the secretions, of the vital powers, and of the circulation. As a general rule, moisture is a sign of the absence of severe fever. Excessive moisture is symptomatic of debility, especially if attended with softness, and indicates the use of tonics, or, to say the least, the avoidance of lowering measures. Dryness of the tongue belongs to that diminution of the secretions which accompanies severe and dangerous fever, though in estimating this sign, we must not forget that the tongue is sometimes rendered dry by the patient sleeping or lying with the mouth open.

Every deviation of the colour of the tongue from its natural tint, deserves attention. A pale tongue belongs to an anæmic or spanæmic condition of the blood, a very red one attends, inflammation of the throat and fauces, and eruptive fevers; redness at the tip and edges, gastric inflammation or irritation; a very red glazed tongue shows a still greater degree of intestinal irritation, probably with ulceration, and is a dangerous symptom. The brown or black coat upon the tongue, is again a sign of the very lowest form of fevers, with failure of the vital powers. The livid tongue we have already alluded to, as showing defective decarbonization of the blood.

The white tongue should be distinguished from the pale tongue, the paleness being, as it were, the complexion of the organ itself, whereas the whiteness appears as if produced by a pigment upon it; this whiteness belongs to the early periods of active fever. A clammy, yellowish, or creamy coating upon the tongue, indicates fever, with considerable gastric derangement; and in more advanced stages of such affections the organ becomes loaded, the coat being thicker, and the colour deeper.

The furred tongue is among the most important of the indications of the febrile state; it has been well compared by Dr. Copland to the pile on the surface of cotton velvets: the origin of the fur is by no means clearly understood; it is, perhaps, referable to marked development, or it may be erection, as in the case of erectile tissue, of the papillæ; under the irritation of the gastro-intestinal mucous membrane, which attends most febrile and inflammatory disease, especially inflammation, of the parenchymatous viscera, of the mucous surfaces, and the encephalon, as well as exanthematous and typhoid fevers. Associated with this fur, may be more or less of the white or creamy, or drab-coloured load just alluded to, and the elongated papillæ protruding themselves through this coat often gives to the tongue a slimy, spotted, or as it is sometimes called "limaceous" appearance. This appearance is peculiarly common in many of the febrile diseases of children, who are especially prone to gastric derangements. When, after the above conditions, the tongue becomes red and clean, without subsidence of the fever, and still more if it become dry and glazed, it is an unfavourable sign indicative of feeble power with much gastric irritation; and if it be dry and dark, the load assuming the form of a brown or black crust, it indicates a state of the lowest typhus, with suppression, or great disorder of the secretions, and contamination of the blood. With a slight fur, again, there may be here and there patches denuded of epithelium, a condition which belongs, perhaps, more to chronic or non-febrile disease of the digestive organs, or to uterine irritation; and an aphthous state of the tongue in adults shows failing vitality, and generally pretty closely precedes the fatal termination of phthisis and other wasting diseases. The only disease in which the temperature of the tongue is materially affected, is the malignant cholera, in the severe forms of which disease, it is often cold from the commencement.

Before quitting the subject of the tongue, we may remark that, though the appearance of the tongue is always more or less affected by disease in the stomach and small intestines, it may remain quite natural in appearance, notwithstanding severe disease beyond the ileo-cœcal valve.

There are, again, two other circumstances which are of great importance in estimating the general condition of the system, and these are thirst and hunger; the former of which is generally excessive, and the latter abolished, during the febrile state.

To appreciate the value of thirst, as a symptom, we should have some definite ideas of the cause of thirst in health and disease. It is commonly stated, that the sense of thirst indicates a deficiency of fluid in the body; this is to a certain extent true in health, that is to say, the sense of thirst indicates a condition in which more water is required for its two important physiological purposes, namely (1) the facilitating the circulation of the blood by maintaining its fluidity, and (2) the cleansing or washing of the blood from those impurities which are destined to be carried out of the system by the liquid secretions. The course of the water in fulfilling this office has been already described (p. 27), and as, in health, the effect is produced by the taking of water into the stomach, the final cause of thirst is no doubt to induce the ingestion of fluid; but in order to allay the sensation of thirst, the water must not only be taken into the alimentary canal, and there absorbed into the blood, but it must also pass out of the system by the proper channels, carrying with it those matters which it is intended to eliminate; and, if this be not effected, the sense of thirst may continue: thus not only is thirst excessive in Asiatic cholera, in which the blood is nearly drained of its water, but also in dropsy, from disease of the kidneys, in which the patient is sometimes, as it were, overwhelmed with the quantity of fluid in the system, the blood being at the same time "watery" in the extreme; so that, looking merely to the blood, not only may thirst be induced by an absolute defect of water in the blood, but also by the presence in that fluid of those substances which the water ought to eliminate; and it is not improbable that the urgent thirst in cholera may arise as much from the latter cause as from the former.

Again, though the cause of the healthy thirst may be in the blood, the seat of the sensation is in the fauces, and that sensation is perceived through the instrumentality of the nerves; it may therefore happen that a disordered state of the part which is the seat of the sensation, or even, of the brain, which receives that sensation, will produce thirst, as well as the condition of the blood, by which it ought to be excited in health; and (by a parity of reasoning) it may arise by disorder or irritation of other parts, which derive their nervous supply from the same source, as in disease or irritation of the gastro-intestinal mucous membrane.

Thirst, then, may be regarded as a sign (1) of absolute defect of liquid in the blood; (2) of excess in the blood, of those substances which the water ought to remove; (3) of irritation in the gastro-intestinal membrane; (4) of disordered innervation.

The final cause of hunger is to induce the ingestion of alimentary substances, whereby the continual waste of the system may be repaired; the seat of the sensation of hunger seems to be in the stomach, and its most satisfactory explanation seems to be, that there is at the same time a determination of blood to the mucous surface of that organ, and an increased excitability of the sentient extremities of the nerves with which it is so freely supplied, though whether either of the last conditions is to be regarded as cause of the other, it may be hard to determine. Healthy appetite for food, then, implies a healthy condition of the system generally, more particularly of the functions of nutrition and circulation,—a healthy state of the nervous system, and of the stomach itself,—but, besides this, in order that the appetite may recur at proper intervals, we must have the food which is taken into the stomach digested and absorbed, and the refuse matter removed from the intestines: a healthy state of all the digestive organs is therefore necessary.

In febrile diseases there is loss of appetite, especially at the commencement: this, however, does not appear to arise from any great diminution in the waste of the tissues, since this goes on apparently with nearly as much activity as in health: the reason of the diminished appetite is, perhaps, rather to be found in the derangement, of the circulation and innervation, and in the disordered secretion. After the febrile state has passed off, there will often be an excessive appetite, arising from the increased requirements of the system to repair the waste which has been going on during its suspension.

In diseases of the heart or lungs obstructing the return of the blood to the right side of the heart, there will generally be loss of appetite; since the consequent obstruction to the passage of blood, through the vena portæ, the splenic, gastric, and superior mesenteric veins, must cause a corresponding congestion of the capillaries of the stomach and small intestines, which must put a stop to the secretion of gastric juice.

In many diseases of the brain, again, we have loss of appetite from loss of proper sensation, or due appreciation, by the brain, of the condition of the stomach; but from disease in the same organ we may also have an increased or morbid appetite from irritation in the sentient organ, producing the sensation without its proper cause; there is in this case a *subjective* instead of an *objective* hunger. Appetite, again, may be excessive from an erythism, or irritation of the stomach itself, though if this proceed to inflammation, it will produce anorexia and sickness. Excessive appetite will also sometimes occur in wasting diseases, as well as in those in which the products of digestion do not find their way into the system; as in disease of the mesenteric glands obstructing the passage of the chyle through the lacteals. Loss of appetite may also arise from languid circulation and torpor of the system generally, through want of exercise and confinement in an impure air. The influence of the nervous system upon the appetite needs scarce further proof than the effect of mental emotion; anxiety and depression, or distressing intelligence, often suppressing it altogether.

Besides the information to be obtained from the sources just indicated, we may learn much by attending to a variety of circumstances in the general aspect and condition of the patient; which, though, at first sight, trifling minutiæ, constitute what we would venture to term the physiognomy of disease; and which, though they may not furnish us with certain evidence of any particular lesion, often act as it were as the finger-posts to our investigations, and point towards the disorder we are to expect, or the particular organ or region of the body to which we should direct our inquiries.

The attitude of the patient and the expression of his countenance are among the first things which deserve our attention. The former may indicate extreme weakness or prostration, as shown by a perfectly supine position, the extended legs, the arms lying powerlessly by the side of the body, and the head either helplessly thrown back upon the pillow, or gravitating, rather than turned, to one side or the other. Again, the patient may be lying on the back, with the knees slightly drawn up, and continually retaining this position from a desire to remove the pressure of the abdominal muscles or bed-clothes, and at once suggesting to the experienced observer an apprehension of inflammation of a portion of the peritoneum. With the supineness of prostration there may also be restlessness and the "disjecta membra" of rapid exhaustion from hæmorrhages or other profuse discharges, as in cholera. There may, again, be inability to lie on one side, as in effusion into the pleural cavity on the opposite one, or the patient may lie with difficulty or pain on one side, as in the early stages of pleurisy and some affections of the heart. Again, there may be inability to lie down at all, constituting what is technically termed orthopnœa, the result of asthma, sometimes of effusion, and sometimes of organic disease of the heart, of extensive and severe bronchitis, pneumonia, or œdema of the lungs. Often, too, when the orthopnœa is the result of inflammation of the pericardium or of the diaphragmatic pleura, the patient sits or crouches forward so as to prevent the movements of the diaphragm, which, in such cases, aggravate his distress. These, and many other peculiarities of position, in lying, or sitting, it will be our duty to notice more particularly in reference to special diseases, and they are here introduced only as instances of the effect of disease upon the position of the patient.

It is not, however, only, in lying or sitting, that we should carefully watch the attitude of the patient. When able to stand or walk there may be a dragging or halting of one leg, indicative of incipient paralysis; or the gait may be staggering and unsteady from cerebral congestion oppressing the nervous power, softening, or other structural change, impairing it, or intoxication suspending it. There may, too, be a hurriedness about every movement, indicating an excessive nervous irritability; or an irregularity and unsteadiness, more especially of the hands and arms, which accompany the first beginning of chorea. The gait, too, may be stooping, with the back raised, and the chest depressed, and the head thrown forwards in disease of the heart, or large arteries, especially aortic aneurism. The wasted victim of organic disease of the stomach or the other abdominal viscera has a stooping gait, often with a hand placed upon the epigastrium, contrasting with the well-fed citizen who has reached the middle period of life, with his digestive powers as yet unimpaired, and who walks erect with his hands crossed upon the sacrum as a sort of counterpoise to the somewhat redundant weight in front.

The expression of the countenance is no less available as a guide to our researches. Like the position of the body, it may indicate simple prostration, as in the advanced stage of low fever, when the countenance is shrunken and collapsed, and at the same time apathetic and inexpressive; or it may be shrunken and contracted, but with the compressed lips and retracted angles of the mouth, constituting the *risus sardonicus*, indicative of acute inflammation in the neighbourhood of the diaphragm.

The expression of pain may accompany not only acute inflammatory diseases, but those also in which there is difficulty of respiration, disturbed or irregular action of the heart, soreness of different parts, and severe neuralgic pain. Anxiety belongs not only to some forms of mania, but also to dyspepsia and its consequence—hypochondriasis, and to other disorders of nutrition, amongst which may be reckoned diabetes, and to most chronic diseases, especially those of the abdominal viscera. An expression of terror is often impressed on the features by hæmorrhages and other exhausting discharges (in cholera the countenance expresses terror rather than pain), by some obscure forms of mania, and above all, by delirium tremens. Rage belongs more particularly to violent delirium whether in the form of mania or phrenitis, contracted features and corrugated brow, to tetanus.

There may, on the other hand, be a want of all expression, in idiotcy and general paralysis, and sometimes in chorea. There may be an almost incessant hilarity in some forms of chronic disease of the brain. The countenance, again, may be heavy, dull, or oppressed in cerebral congestion, and there is sometimes a bashful, downcast look in the hysterical female; and this, with the averted eye, belongs equally to those of either sex who have impaired their nervous power, and with it, often, their physical and moral courage, by self-abuse.

The colour or tint of the countenance is much affected by disease. It may be rendered pale by the want of red corpuscles in the blood: this paleness may show itself in somewhat different characters, as in the dingy whiteness of malignant disease, in the waxen hue of amenorrhœa, and in the white and puffy countenance of dropsy from disease of the kidneys. It may be coloured also by retained secretion. Thus, when there is excess of bile in the blood the face, as well as the general surface of the body, becomes yellow, and so do the conjunctivæ. The retention of the colourless urea, or uric acid, does not tinge the blood, or through it, the countenance. The deep blue tint imparted to the corpuscles by carbonic acid shows itself in the countenance, when the elimination from the blood of that gas is interfered with; whether it be by difficulty of access of air, as in choking, or suffocation,—or by other affections tending to apnœa from obstructed pulmonic circulation, as disease of the lungs or heart, a mixture of the blood of the two circulations, as in communications between the two sides of the heart,—or its stoppage by loss of fluidity, as in cholera. A most remarkable alteration in the complexion is the dingy, chestnut, or even *bronzed* colour of the skin, sometimes occurring in patches, and sometimes pervading the whole surface: the discovery of which, in connection with disease of the supra-renal bodies, has been reserved for the acumen of Dr. Addison.

In the clinical investigation of disease we must not omit to cultivate another sense, which will often give us most important information, namely, the sense of smell. And though it may not be very easy to describe an odour, it is by no means difficult to remember one that may be frequently presented to us. Thus the sourish odour from the perspiration which continually bedews the surface in acute rheumatism cannot easily be forgotten, and there is an odour not so easily recognized about the persons of those suffering from jaundice or albuminuria. A cadaveric odour, which is a most unfavourable omen, hangs about those in whom the blood is, as it were, stagnating in the capillary vessels, as in cases of the typhus and exanthematous fevers, and in great venous obstructions where the cadaveric changes seem, as it were, to precede the apparent death of the patient. Besides this there is an odour peculiar to different fevers, as typhus, scarlatina, and small-pox. There are, again, characteristic odours about the breath, as the hay-like smell in diabetes, and the sourish smell of the breath of children with any tendency to gastric fever; and a smell not very different from this, which may be observed in adults who are affected with venous congestion of the liver; and a smell which is next to impossible to describe, which is not, however, like the smell of alcohol, which may be detected in the breath of the habitual drunkard. The fœtor of the breath from mercury, and which often precedes its more decided effects upon the gums, should be familiar to every practitioner; as should all the smells of alcohol and various other poisons which affect the breath as soon as they have been swallowed. The odours of many discharges, as, for instance, the urine, when there is incontinence or dribbling from retention, as well as various uterine discharges, should also immediately attract our notice, and may often suggest important questions; at the same time they may lead to the discovery of any neglect of cleanliness on the part of the attendants.

VI.

FATAL TERMINATION AND TREATMENT OF INFLAMMATION.

Before proceeding to consider the treatment of inflammation, it is desirable to have clear notions of the different modes in which it may prove fatal, since one of the most important indications of treatment in all diseases is to "obviate the tendency to death." It may be observed, however, that the fatal termination of inflammation is scarcely ever the necessary and inevitable effect of the inflammation as such, but is the consequence of its intensity, or of the extent and degree of its results, and not of the mere fact of its presence.

Inflammation may sometimes prove fatal in its very commencement, by its depressing effect upon the moving powers of the circulation, before any structural alteration has taken place in the inflamed part. The tendency to this termination is indicated by the rapidly-increasing feebleness of the pulse and failure of the heart's action, cold extremities, shrunken features, and clammy perspiration; the powers of voluntary motion not being for the most part depressed in the same proportion, and the intellect remaining unimpaired. The best illustration of this fatal effect is to be found in inflammation of the peritoneum, especially when it attacks the part investing the stomach or neighbouring viscera. Inflammations of other serous membranes, as the pleura or pericardium, may sometimes threaten the same consequence, especially when that inflammation is excited by any sudden mischief, the result either of disease or accident. Inflammation of the mucous membrane of the intestines is also attended with more or less of the same depressing effect upon the heart's action, and the same thing may be seen, though not so frequently, as one of the earliest consequences of inflammation of the large joints and more important viscera: thus we may have death by syncope, as an early and direct result of inflammation, before it can have produced such structural change in a vital organ as to impede any function necessary to the continuance of life, and in a manner different from that which would ensue from such impediment.

Death in a mode not far differing from that by syncope, that is to say, by a more gradual failure of the moving powers of the circulation—death from sinking, as it is commonly termed—may take place at any period of severe and extensive inflammation.

The tendency to death in either of the above modes should never be lost sight of in the course of any severe inflammation, especially if it be seated in an internal organ, since this sinking, or gradual syncope, may supervene at any period; unpreceded by any appreciable signs of increase in the extent or intensity of the inflammation, though its approach may often be foreseen and averted by one who watches carefully the effects of the disease upon the circulation and the nervous system.

Inflammation may be fatal by its arresting the functions of some vital part, either directly, or by means of the effusions consequent upon it.

Inflammation may suspend the functions of an organ by its mere presence in great intensity, independently of any structural alteration of the part. Of this we have an instance in the arrest of the peristaltic movement which attends the commencement of enteritis; and it is probably in this way that we are to account for the convulsions, delirium, and paralysis, or stupor, which sometimes attend the first onset of inflammation of the brain.

Inflammation may cause death by the serous effusion, which is its first result, obstructing the functions of some vital part, as in inflammatory effusion of serum upon the surface or into the ventricles of the brain, causing death by coma; effusion into the submucous areolar tissue of the glottis, causing death by strangulation and apnœa; rapid effusion into the air-cells of the lungs, or into the pleura, producing death by apnœa—into the pericardium, causing death by failure of the heart's action, or syncope.

The plastic effusion from inflammation may prove fatal by the mechanical obstruction which the fibrinous lymph opposes to the performance of some function essential to life; as, when respiration is obstructed by the lymph effused upon the mucous lining of the larnyx or trachea in acute inflammation of those passages, or more slowly by the thickening of the membrane by the deposit of lymph in the submucous areolar tissue—or when the action of the intestinal canal is arrested by the lymph effused on the surface of the inflamed peritoneum; or the passage of its contents stopped by the thickening and contraction resulting from the effusion of plastic lymph into the submucous tissue. In the same way the action of the heart may be greatly obstructed, if not altogether arrested, by adhesive inflammation of the pericardium.

Death may also take place from the mechanical effects of puriform effusion in obstructing the functions of some vital organ, in the same manner as does the effusion of serum. Thus we may have death by coma from puriform effusion on the surface of the brain; death by apnœa from deposits of puriform matter producing pressure upon the larnyx, trachea, or bronchi, or from great puriform effusion into the air-passages, or into one or both of the pleuræ.

But there are other and more direct ways in which death may ensue from suppuration: 1, by the exhaustion resulting from the continual drain of a large discharge of puriform matter, diminishing the quantity of blood and rendering it poor, so that the action of the heart fails for the want of its accustomed stimulus, and death takes place by a gradual syncope; 2, when puriform matter finds its way into the circulation, and acts as a poison in the system, as in the case of inflammation of the lining membrane of a vein, the accompanying fever being in such cases attended with, a feeble action of the heart, and derangement of the nervous system; death, when it does take place, coming on more in the way of syncope, though sometimes with a tendency to coma.

As ulceration is almost constantly accompanied by suppuration, which may be very great; it follows that when the former is very extensive we may have death from the discharge of pus leading to exhaustion, and also death from puriform infection (or ichoræmia) as above described. Death may also result from the secondary effects of the injury inflicted by the ulceration, as when the tunics of any portion of the alimentary canal are perforated by an ulcer, and the escape of the contents gives rise to sudden inflammation of the peritoneum, which is often attended by collapse, terminating in death by syncope, or the same fatal termination may be induced by hæmorrhage, owing to a considerable vessel being laid open in the progress of ulceration.

The leading objects which we should place before our minds in the treatment of inflammation are—

I. To remove or obviate the exciting cause of inflammation when we can ascertain that cause, and when it is one which we are able to control.

II. To prevent and remove all other circumstances which may tend to excite or keep up the inflammatory action.

III. To induce, if possible, the resolution of the inflammation; though, at the same time, we must be careful to anticipate or counteract that tendency to death from sinking, or asthenia, of which we have already spoken as liable to occur at any period, and which constitutes one of the chief dangers of very severe and extensive inflammation.

IV. When we perceive that one of the results of inflammation already described must ensue, to lead that process to its most favourable termination.

I. It not uncommonly happens in surgical practice, that inflammation has been excited, and is still kept up by some cause which can be removed, as when there is a splinter in the hand, or inflammation has been excited by the extremities of a fractured bone, or the mucous membrane of the bladder is irritated and inflamed by a calculus; in which cases the splinter may be excised, or the fracture reduced, or the stone removed: but in medical practice (and particularly when we have to deal with acute inflammation) it oftener happens that the cause of the disease has ceased to act, and we have to deal only with the inflammation which remains as its effect; or, if there be any internal cause still at work, we are not able to reach it, as is the case with inflammation of the peritoneum from a perforating ulcer of the intestine, or of the appendix cœci from a foreign body lodged in its canal; though there may, indeed, be an irritating substance in the stomach or bowels which we can neutralize or remove.

In many inflammations of a more chronic character there may be causes still in operation; as exposure of the lining membrane of the air-passages to irritating gases or pulverized substances; or inflammation of the mucous membrane of the alimentary canal may be kept up by stimulating drinks, or irritating articles of food; and in any such case we may often be enabled to put an end to the cause, and so bring about the subsidence or resolution of the inflammation to which it had given rise; though we may not thereby remove the change in the condition of the part which the inflammation had slowly and insidiously brought about: for it is very important to bear in mind that there is a wide difference, both pathologically and in practice, between the inflammation which produces a certain structural change, and the derangements consequent upon that change; and, perhaps, one difficulty in the treatment of chronic inflammations consists in the circumstance that this structural change commonly goes on *pari passu* with the inflammatory action which produces it.

Although, however, the cause which excited the inflammation may have passed away, or be necessarily beyond our control, we may, by knowing it, be enabled to prevent its repetition, and gain some guidance as to our practice in other respects: thus we should not treat an inflammation of the pleura from cold, in the same manner as one from perforation of the lung, or, of the pericardium from rheumatism, as one from disease of the kidneys.

II. In order to carry out the next object, viz., the prevention and removal of all circumstances which may tend to keep up, or re-excite the inflammatory action, we have two considerations to attend to.

1. The removal of all those circumstances which may tend to maintain an inflammatory action in the system at large. In those instances in which the inflammation is ushered in by hot skin, white tongue, and hard pulse, and in which the symptoms generally, as well as the previous history of the patient, appear to be premonitory of an active or sthenic form of disease; this is effected, in great measure, by what is commonly termed, the antiphlogistic regimen, the object of which is to place the patient in a condition which most favours the spontaneous subsidence of the inflammation; it consists in the avoidance of whatever tends to excite the action of the heart or arteries, as stimulating drinks, animal food, muscular action, mental excitement, stimulants to the external senses, as light and noise: it may be summed up in the few words low diet, rest, quiet. But, on the other hand, there are cases which from the commencement exhibit signs of debility and sometimes at an early period threaten death from asthenia. In such instances, although it is admitted that there are some organs the inflammation of which is generally attended with greater activity than that of others, still, whatever be the organ affected, lowering or antiphlogistic remedies must be employed with the greatest caution, and often not only must they be laid aside but a stimulating plan of treatment steadily employed.

2. We must put out of the way, as much as possible, all those circumstances which may excite the afflux of blood to the particular part or organ inflamed: thus, when there is inflammation of a limb, we keep it in such a position that the afflux of blood towards it will not be favoured by gravity; and if a joint is inflamed we keep it at rest, and on the same principle must we deal with inflammations of internal parts. We must endeavour to obviate the determination of blood towards them, and as an important means towards this end, to suspend, or diminish as much as possible, the performance of their proper functions; or, where this is impossible, to remove, as far as we can, all things that may tend to stimulate them.

This principle, though important and self-evident, is not perhaps recognized as capable of such general application in the treatment of inflammations of internal parts, as it undoubtedly is; thus we should not only remove the stimulus of light from an inflamed eye, and of sound from an inflamed ear, but that, of all strong impressions of the senses, and of mental excitement from an inflamed brain. The mechanical excitement of speaking must be avoided when the larynx, air-passages, and lungs are inflamed; but the irritation of an acutely inflamed bronchial membrane, by those expectorants which stimulate it, when exhaled by the lungs, must be as carefully abstained from; and the steady maintenance of a uniform temperature is to be enjoined upon the same principle, because a want of heat, or variation of temperature, by calling for a greater activity in the function of respiration, quickens the circulation through the lungs. Nature shows the necessity of suspending the function of the stomach, when that organ is inflamed, by the immediate rejection of any articles of aliment that may be taken into it; but art is not always equally cautious to avoid the excitement of the peristaltic action of inflamed intestines. If calomel be, as is commonly supposed, a stimulant of the liver, it ought, at least, to be used with caution when that organ is inflamed; and the same principle ought to be applied to the use of diuretics when the secretion of urine is suppressed by the inflammation of the kidneys.

III. The above remedies, namely, the avoidance of the exciting causes of inflammation, and the abstraction of those conditions which aggravate or keep it up, though highly important and necessary to be appreciated, must be regarded in the light rather of negative than positive agents. We come now to speak of those means which have a direct influence in checking the inflammation, or of fulfilling the third indication above mentioned, namely, the inducing, if possible, its resolution. Of these means, the most powerful is the abstraction of blood.

Blood-letting is of two kinds, general and topical. General bleeding is the abstraction of blood from a single vessel sufficiently large for the purpose, as by arteriotomy or the opening of an artery, or phlebotomy or venesection, *i. e.*, opening of a vein. Topical bleeding is the withdrawal of blood more slowly from the smaller vessels of a part, for which purpose various means are employed; the more common of these are cupping, the application of leeches, and scarifying or puncturing, with a lancet. As regards the expediency of these different methods of one or the other kinds of bleeding, the common mode of general bleeding by the opening of one of the veins at the bend of the arm, is undoubtedly the most convenient, as being the most easily applicable, and affording the greatest facilities for regulating the quantity to be abstracted, and the rapidity with which it is to flow. In some subjects, however, especially fat and healthy persons, the veins are very small, or lie so deep as to be reached with difficulty, in which case, a more accessible vein in some other part may be chosen, or arteriotomy may be performed. The objection to this latter operation is the difficulty, that there frequently is, in making an opening into an eligible artery large enough to allow of the flow of a sufficient stream of blood, and the difficulty when this has been done of closing the vessel so as to prevent subsequent hæmorrhage; it ought therefore never to be performed excepting in an artery upon which we are able to use permanent pressure, as the temporal. On the other hand, it is supposed by some practitioners that arteriotomy combines the effects of general and local bleeding, by diminishing the circulation in the part supplied by the artery, and at the same time withdrawing the blood quickly from the system, as in venesection.

The different methods of topical bleeding are applicable to different circumstances. Cupping is perhaps the most efficacious and the most speedy; it is also but little likely to be followed by excessive hæmorrhage. On the other hand, it is more painful, or at all events more terrifying to the patient than the application of leeches; the blood is also more quickly abstracted by this method, so that it has more of the effect of general bleeding, and therefore is sometimes inapplicable where the latter is strongly contra-indicated. In females, too, some weight must be given to the consideration of its leaving unsightly scars, where the part from which the blood is to be taken is not ordinarily covered by the dress. Cupping has the further effect of a kind of revulsion, by drawing a considerable quantity of the blood to the part over which the cups are applied. The operation of dry cupping, as it is termed, *i.e.*, without the scarificators, is employed with this intention, and has sometimes a beneficial effect in withdrawing for a time a portion of blood from the pale of the circulation, in cases where we are fearful of permanently abstracting it from the system.

Leeches again have the advantage of being readily applied, and are not so formidable to the patient; they can also be used in situations where the cups cannot be placed; and as the blood is withdrawn more slowly they are better adapted to those cases in which we do not wish to produce the more depressing effect of a rapid abstraction of blood. On the other hand, they are liable to the objection that the bleeding from them cannot be stopped at pleasure, so certainly as from the incised wounds of the scarificators, and therefore their use should be as much as possible avoided, where we apprehend a hæmorrhagic condition of the system; for this reason cupping is to be preferred in jaundice. They are also apt in some persons to excite erysipelas, and therefore inquiry should be made as to whether there exists this tendency in the individual; their use should also be scrupulously avoided where there is a possibility of the patient receiving the infection of this disease, either from its general prevalence at the time, or from the possibility of its being conveyed, as in hospitals, by nurses or other attendants.

Scarification is chiefly employed in superficial inflammation, as of the integuments or areolar tissue immediately underneath them, and has the advantage of directly unloading the smaller vessels.

(1.) The effects of general bleeding are commonly stated to be—1, a diminution of the force and frequency of the heart's action; 2, a derivation of the blood from the inflamed part; 3, a modification of the character of the blood itself.

The blood is the natural stimulus of the heart, by which the contraction of its cavities is excited and maintained; and although the heart of some animals will continue to act for a time, even after removal from the body, yet the effect of loss of blood upon persons in health, as well as that of obstruction to the supply of blood to the left ventricle in disease, shows that the consequence of a withdrawal of this stimulus is a diminution in the force and frequency of the heart's action. At the same time it may be observed that this depression is not entirely owing to the direct effect of the withdrawal of its accustomed stimulus from the heart, but also to the rapid removal of the pressure upon the brain and medulla oblongata; though the effect of this latter has, as we have already seen in speaking of syncope, been considerably over-estimated. Still it is an important fact "that when blood is drawn in the erect posture, so that the influence of gravitation co-operates with that of the operation in weakening the flow of blood to the head, not only are the sensations and consciousness of the patient, *i. e.*, the functions of the brain and medulla oblongata, much sooner affected; but the heart's own action is much sooner impaired than when the same quantity is taken from a patient lying horizontally: a most remarkable diminution of the frequency of the pulsations is thus very frequently effected, the pulse falling, for example, from 120 to 60 in a minute, at the same time that faintness and transient insensibility are produced."* We perceive then that the depressing agency of depletion is twofold,—the one more speedy and at first more powerful, but on the other hand more transient, acting through the brain and medulla oblongata, and producing an effect like that of sudden concussion or shock,—the other more gradual but more persistent, arising from the abstraction of the vital stimulus; and so distinct are these modes of action, that some persons, even when labouring under inflammation of an active character, will, if bled in a full stream, and in an erect position, become faint before blood has been drawn in sufficient quantity to produce permanent effect upon the disease; although if it be drawn slowly, and when the patient is in a recumbent position, the desired impression may be produced before faintness comes on. This effect of blood-letting upon the nervous system must act also upon one of the requisites of a healthy condition in the inflamed part, viz., the due supply of nervous influence, and consequently materially affect the character of the inflammatory lymph, and its subsequent progress towards organization or degeneration.

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* Alison's 'Outlines of Pathology and Practice,' p. 217.

(2.) It is not, however, solely by diminishing the injecting force of the heart that bleeding acts in relieving the distension and congestion of the vessels of the inflamed part; it does so in some degree by diminishing the entire mass of blood in the system, but still more by what appears to be a withdrawal of the blood, from the part affected, to that whence the blood is drawn: this effect is termed *derivation*, and the precise mode in which it is brought about requires further investigation. Whether, as some have imagined, it is the mere result of the contractility of the vessel causing a flow to any part where an opening is made; or whether, as Haller, with perhaps more reason, considered, it cannot be explained upon merely mechanical principles, certain it is that this derivation may be seen to take place in the smaller vessels when one of them is punctured under the microscope; and according to Haller the movement often occurs to such an extent as actually to invert the natural course of the circulation. Such being the case, it is to be expected that general blood-letting must exert a similar influence, upon the blood stagnating in inflamed parts; and that some such result is produced independently of the diminution of the force of the heart's action. is shown by the fact of blood-letting having the effect of reducing inflammatory action in certain cases where the pulse is very small, as in inflammation situated about the stomach; and where also the pulse after the bleeding becomes fuller or stronger than before.

It may hence be inferred that topical bleeding would be the most effectual for the purpose of derivation, and such is actually found to be the case in practice; and indeed it is when the force of the heart's action has been reduced by general bleeding, or has subsided, under the use of other remedies, or from the disease assuming a less acute form, that we find topical bleeding of such marked efficacy in relieving the local congestion. At the same time general bleeding is not without its derivative effect, as seen in the instance of abdominal inflammation already alluded to; and topical bleeding in some forms exerts a considerable influence upon the action of the heart and large vessels; as when blood is taken freely by a dextrous cupper, and also when leeches are applied to young children, in whom they may be regarded as equivalent to general bleeding; so that the primary object of general bleeding for inflammation is to reduce the action of the heart, although at the same time it exerts a considerable derivative influence; whilst, on the other hand, although we use topical bleeding, as cupping or leeches, chiefly with a view to its derivative agency in relieving the gorged vessels of the inflamed part, we must not forget that it exerts some influence on the action of the heart.

There is another circumstance, which is also important in practice, tending to show that the derivative action of local bleeding is not to be explained upon merely mechanical principles; namely, that it is useful when applied to the surface of the body, near an inflamed internal organ, (as to the surface of the chest corresponding to an inflamed portion of lung,) although there be no continuity of vessels between the surface, from which the blood is drawn, and the inflamed part.

(3.) There is again another result of blood-letting in inflammation, the nature and extent of which still require further elucidation, and that is the alteration produced in the condition of the blood itself. We have already seen that the leading characteristic of inflamed blood is an increase in the quantity of fibrine and colourless corpuscles, as well as an increase in the fibrillating or contractile force of the former. Now, that these conditions proper to inflamed blood are reduced by bleeding, we have reason to believe, from the effect of two or three bleedings upon the thickness, and firmness, of the buffy coat. Whether the cause of this be the abstraction of a portion of the fibrine, or whether it consist in diminution of its vital contractility, or whether it be brought about through the influence of the nerves, we are perhaps at present hardly in a condition to determine, though it is very difficult to discard the latter.

Another important effect of blood-letting, especially if repeated, is to diminish the proportion of the red corpuscles; though it must be remembered that the decrease in the quantity of this element of the blood does not diminish the tendency to inflammation in the system, and consequently this consideration weighs rather against the too active use of depletion, than in favour of its repeated performance.

Upon the whole it appears that the diminution of the force and frequency of the heart's action, and of the increased arterial current,—the restraining the afflux of blood to the injured part,—and also, the correcting that altered condition of the blood (which, though it may be the consequence rather than the cause of the inflammation, is no doubt effectual in keeping it up), are the immediate results which we may hope to obtain by blood-letting; yet it does not follow that we in this way necessarily cut short the inflammation, or that in those cases to which it is applicable, the remedy has been without good effect even if the disease has extended, or inflammatory effusions have taken place after its use, since it is very possible that the intensity of the inflammation may have been restrained, and the character of the effusion modified so as to favour its absorption; the effect of the bleeding under such circumstances being that, in the words of Dr. Alison, "it disposes to a favourable termination." Neither, on the other hand, is it by any means certain that when a partial subsidence of the inflammation has taken place after blood-letting, and the inflammation has afterwards extended, or inflammatory effusions of an unfavourable character have taken place, that the use of the remedy has been without any ill effect, since it may have modified the character of the effusion beyond the point which favours its absorption, and consequently have promoted its degeneration and disintegration: the effect of the bleeding under such circumstances will have been to dispose to an unfavourable termination.

Having now passed in review the different methods of abstracting blood, we are better prepared to consider the conditions under which it ought or ought not to be performed in the treatment of inflammations. That bleeding, when applied at the right time and under fitting circumstances, has the power of subduing inflammations, equalling or even exceeding that of any other remedy, is a truth equalled, if not surpassed in importance by another, viz., that when ill-timed as regards the period of the inflammation, or performed in defiance of contrary indications, arising from the character of the inflammation or the condition of the patient, blood-letting is as injurious as regards the progress of the former, as it is dangerous to the life of the latter.

It perhaps ought always to be remembered that the number of cases in which bleeding is admissible is far less than those in which it is injurious, or even dangerous: a consideration which certainly ought to have great weight in doubtful cases; though it does not impugn the principles which should guide us, in the selection of those to which it is applicable. These fundamental principles are few and simple, and may be readily inferred from what has been stated of the nature of inflammation, and the effect of the remedy; that on the one hand it is capable of cutting short the inflammation, disposing to a favourable termination, or so modifying the character of the inflammatory effusion as to favour its absorption; on the other, it may dangerously or even fatally depress the powers of the patient, or so modify the character of the effusion as to promote its degeneration and decay, and consequently render it incapable of being either organized or absorbed.

It is not indeed possible here, to give special rules for the application of these principles, they must be reserved till we come to speak of special inflammations; but experience has furnished us with certain general indications, which must on all occasions be borne in mind.

First of all we must look to the external conditions affecting the patient: thus, in some situations bleeding is generally better borne than in others—in the country, for instance, than in large towns; and by those living on dry soils and elevated situations, than by those living in low or marshy districts. Again, the condition of the atmosphere at certain times, or, what was called by Sydenham, the epidemic temperament, has a considerable influence in this respect; *e. g.*, during the prevalence of several epidemics, bleeding is very ill borne, not only by those in whom inflammation may have supervened, when suffering under that epidemic; but also by others in whom it would appear to have arisen independently of it.

Old persons and young children, generally, do not bear loss of blood well, though in both, especially the former, it is sometimes unavoidable. Women, again, are less tolerant of bleeding than men; persons of large bulky frames, than rather more spare, but muscular subjects. Those who have lived poorly, that is to say, without a sufficiency of animal food; those who have been addicted to intemperance, or exhausted by long-continued previous disease, are especially susceptible of the depressing effects of the loss of blood; and it may be added, that those who live, as it is termed, generously, are less tolerant, either of disease or blood-letting, than those who are abstemious in the use of alcoholic liquors. When, again, inflammation supervenes upon fever, especially of a typhoid character, there is not the same power to bear loss of blood, as in the same inflammation occurring under different circumstances.

The state of the pulse, again, affords the most reliable indications as to the tolerance of blood-letting. It will be the greatest when there is a frequent and strong contraction of the ventricles, associated with a forcible contraction of the artery, which is the condition produced by active inflammation in a sound constitution; and which, as we have already explained, manifests itself by a frequent, hardly-compressible, and moderately-full pulse, which is also rather sharper than in health, owing to the ventricular contractions taking place somewhat more suddenly. When bleeding is performed under these circumstances, it will commonly be found that the pulse becomes less frequent, smaller, and softer: there are, however, cases of inflammation in which blood-letting may be of great service, but in which some of the above conditions may be wanting, the reasons of which exceptions from the general rule are, however, included in the principles already laid down: thus when the inflammation is situated in the abdomen, if it be near the stomach or duodenum, the pulse is not uncommonly very small, though sharp; the depressing effect upon the heart through the great plexus of nerves more than counterbalancing the exciting influence of the inflammation: and from an analogous cause, viz., the depressing effect upon the nervous centre, we often have, in inflammation within the cranium, a slow, but hard pulse, and sometimes an intermitting one. There are again apparent exceptions of an opposite character, as, for instance, when one or more of those conditions of the pulse are present, which indicate a state of the system in which bleeding would be of service, but in which such a state does not really exist; thus we may meet with an apparently hard pulse in old persons, or those who have lived intemperately, or have followed very laborious occupations, or are the subjects of visceral disease (particularly that of the kidneys); but here the hardness is not in the pulse, but rather in the artery itself, the pulse being often abolished by very moderate pressure, the artery remaining like a cord under the finger.

The other condition to which we have alluded, viz., the buffy coat of the blood, is one which presents many exceptions, or seeming exceptions, though it is probable these will disappear, as the subject is more thoroughly investigated. We have already seen that inflammation is not the alone cause of the buffy coat, but that it depends partly upon the proportion of fibrine to red corpuscles; partly upon the rapidity with which the latter subside, proportionably to that with which the coagulation of the former takes place; and partly upon the presence and proportion of colourless corpuscles.

Now in inflammation we have observed the coincidence of several of these conditions, viz., the large proportion of fibrine, the rapid subsidence of corpuscles, owing in a great measure to their aggregation in rouleaus, the increased contractility of fibrine, and the abundance of colourless corpuscles: hence the buffing and cupping of the blood, which in the early stages of inflammation, constitute an indication for bleeding. It must. however, be remembered, that as the change in the blood is, in primary inflammations, probably produced by passing through the vessels of the inflamed part, there will generally some time elapse after the commencement of the inflammation, especially if it be not of great extent, before there can be produced in the blood that change in virtue of which the clot becomes buffed and cupped, and consequently the absence of the buffy coat at the commencement of an inflammation, and when we have good evidence from other sources of its existence, is not to be regarded as a sufficient proof that the bleeding will not prove beneficial. For the same reason we can understand that as long as the inflammatory action continues, this altered condition of the blood must be kept up, after the period at which blood-letting is beneficial, as when inflammatory exudation has taken place, or even ulceration and suppuration have commenced; so that whilst in the former case we are not to regard the absence of the buffy coat as a proof of the impropriety of bleeding, we must not, in the latter, receive its presence as an evidence of its expediency. Again, in anæmia there is a large quantity of fibrine, proportionately to the red corpuscles, and therefore one of the conditions favouring the formation of the buffy coat, which is accordingly found to occur without the presence of inflammation, or any other condition indicating the use of the lancet. Not, however, that we are to infer from this, that because there exists an anæmic condition, there can therefore be no inflammation, for the subjects of anæmia are as prone to inflammation as others, or even more so, but we must look for the proofs of its existence elsewhere than in the buffy coat.

The danger of death occurring directly from the loss of blood, need hardly be considered, when the operation is performed by, or under the direction of, a duly-qualified practitioner (and by none other should it ever be allowed to be undertaken), since there are always the premonitory signs of paleness, collapse, cold sweat, failing pulse, &c.; but in estimating the direct ill effects of excessive depletion, we must not forget, that after a considerable loss of blood, there commonly ensues a reaction, accompanied by a fulness and sharpness of the pulse, and an apparently febrile heat of skin, with a giddiness and *tinnitus aurium*, which may be mistaken by the unwary for a return of the inflammatory action, and be supposed to indicate a repetition of the bleeding, which if not directly dangerous to the patient, would have an injurious effect upon the progress of the disease. This state of vascular excitement is, however, tolerably well known, and easily recognized, the pulse, which is frequent, full, and sometimes even sharp (having what is familiarly known as the hæmorrhagic jerk), differs from the true inflammatory pulse, in which bleeding is indicated, in its want of hardness, for it is readily compressed; the heat of the skin too is never persistent, disappearing when the clothes are removed from the part: there is pallor of the lips; and the giddiness, and *tinnitus aurium*, are increased by the erect, and relieved by the recumbent, posture. This state of things may indeed co-exist with the persistence of inflammation, but nevertheless it is a condition, or stage of inflammation, in which blood-letting is no longer beneficial.

The dread of subsequent and permanent injury to the constitution by bleeding, is, by some, regarded as chimerical; yet although the apprehension of immediately setting up dropsy may be discarded as visionary, there are, nevertheless, good grounds for believing that, when bleeding has been carried so far as to produce a deficiency of fibrine and red corpuscles, which is among the known effects of repeated loss of blood, this deficiency is often very slowly repaired, and that, as long as it exists, there will (besides the ill effects upon the present inflammation), be a tendency in any future inflammation to assume an aplastic or cacoplastic character; and further, that this poor condition of the blood has in several instances given rise first to functional, and afterwards to organic disease of the heart, of which dropsy has been one of the least serious consequences.

In speaking of blood-letting as a means of procuring resolution of the inflammation, we may be supposed to assume that it is applied in the early stage of the disease, and before any, or at all events extensive, effusion has taken place, and it is to this period that it is specially applicable; but it may not be out of place here to observe, that when plastic effusion has taken place, it is to be used with caution, since there is great danger of causing the effused lymph to break down into suppuration (together with the parts into which it has been effused), by diminishing the vital power. It is true, indeed, that we commonly have different parts of an organ in different stages of inflammation at the same time; so that it is difficult, or rather impossible, to lay down any precise rule as to the period at which blood-letting ceases to be useful, and, consequently, we must look to the constitutional symptoms to guide us. Thus, when there is a diminution in the intensity of the febrile symptoms without any in the local ones, we may fairly infer that the structural change which had been produced by the inflammation is more a matter for consideration than the inflammation itself: and the recovery from such change being a slow process, and one which anything tending to depress the vital powers would convert into a destructive one, measures having such a tendency, and more especially bleeding, must be useless. But if, further than this—there is a change in the *character* of the febrile symptoms, the heat of skin becoming less, or alternating with chills or perspirations, the pulse more compressible, though quicker and more irritable, and the tongue redder, the local symptoms either, not subsiding, or increasing, we have reason to apprehend not only that the time for blood-letting has passed, but that the part which has been inflamed, or, at least, a portion of it, is already undergoing a process of disorganization, or, if it be a membranous surface, that its increased secretion is becoming puriform.

The kind of inflammation is also important in reference to the expediency of bleeding. In scrofulous or aplastic inflammation, not only is there greater risk of increasing the disorganization by reducing the vital power; but it is also found, as a matter of experience, that such inflammations, even at their outset, are little, if at all, controlled by bleeding; and as the tendency to scrofulous disease is increased by debilitating causes and great evacuations, we incur the risk of aggravating the primary and constitutional mischief. In rheumatic inflammation again, under favourable circumstances, there is much benefit from a full bleeding at the very commencement, and this benefit is the greater, the greater the similarity to ordinary inflammation, and that, too, when there is metastasis of the rheumatic inflammation to internal parts, as the pericardium or pleura; and, perhaps, in cases such as we have just mentioned, the proneness to metastasis is diminished by it; but where the rheumatic inflammation of the extremities has existed for many days, or is of a less active character, there is good reason to think that that *proneness* is increased, if under the influence of the depletion, the former recedes suddenly from the extremities. In gout the use of the lancet is, as a general rule, dangerous, as it is still more apt, than in the former case, to give rise to retrocession of the inflammation, followed by a gouty affection, of an inflammatory, or of a neuralgic, character, of some vital organ.

In specific inflammations of the skin, as erysipelas or small-pox, bleeding is to be avoided. In all such cases, we have a complication with a more dangerous disease, namely, fever; so that whether the inflammation belong, as it were, to the disease, and be essentially characteristic of it, or whether it occur only as an accident, the system is under the influence of a depressing cause, and the blood in a condition the most opposite to that which is favourable to its abstraction; and it must be further borne in mind, that the agency of this specific cause or poison is commonly a more dangerous thing than the inflammation itself, and that there will generally be greater danger of reducing the vital power by depletion, than of allowing the inflammation to remain uncontrolled by it; though it is by no means generally true that inflammations of this character are subdued by bleeding. There are, no doubt, occasional exceptions occurring, perhaps, less rarely in a rural than a town population, in which the depression of the powers of life is the less, and the intensity of the inflammation the greater danger, and where it will be the safe course to check the latter by early and decisive antiphlogistic measures. In estimating the relative amount of these dangers, there is of course occasion for the exercise of sound discretion; the greater or less tendency to depression in the fever on the one hand, and the character and intensity of the inflammation on the other, requiring to be carefully weighed, as well as the nature of the prevailing epidemic, and the ordinary considerations of the period of the disease, and the age, constitution, habits, &c., of the patient.

As regards the complication of chronic or non-febrile disease with inflammation; when a patient becomes affected with inflammation, who has been previously the subject of any chronic disease, the effect which that disease has already produced upon the constitution will be the best and safest guide to direct us in determining the probable tolerance of blood-letting: at the same time, we ought always to be inclined to caution under such circumstances; since the general effect of these diseases is not only to impair the nervous power, but often to diminish the solid contents of the blood,—*e. g.*, in cases where there has been any long-continued discharge connected with the disease, or, where there has been structural change, especially in the viscera of the chest or abdomen, by which the due elaboration or depuration of the blood is impeded, there is a deficiency in the more highly-vitalized ingredients of the blood, the fibrine, and red corpuscles, upon the abundance of which the tolerance of blood-letting greatly depends. As instances of the above, we need merely notice—inflammations occurring in females who have suffered from protracted leucorrhœa,—inflammations of the lungs, or bronchia in the subjects of old emphysema,—inflammation within the abdomen, supervening upon the structural change in the liver, and—inflammation of serous membranes arising in the subjects of disease of the kidneys.

Next to blood-letting as an evacuant in inflammation, is the administration of purgatives; these, when so used as to affect the surface of the mucous membrane of the small and large intestines, have the double effect of removing fæcal matter, which when lodged there, proves an additional source of irritation, and interferes with the action of other internal remedies. and—by carrying off serum from the surface of this membrane—aid the action of blood-letting, or may even prove an efficient substitute for it, where there is reason to apprehend that there may not be a sufficient tolerance of it; and they may be so exhibited when there is no ground for dreading inflammation of the membrane; though, if pushed too far, they may excite it, or produce a depression as great as that which ensues from the abstraction of blood. Their best effect is therefore obtained from a few active doses at the beginning of an inflammation, so combined as both to excite the peristaltic action of the whole tube, and increase the secretion from the intestinal membrane. The best fitted for this purpose is the combination of jalap and calomel, senna with sulphate of magnesia, or senna with manna and tartrate of potass, to which last a small quantity of tartar-emetic may often be added with advantage; the union of several of these will be found most effectual : *e. g.*, a moderate dose of jalap and calomel may be given at once, and a draught of salts and senna after a few hours.*

We have alluded to irritation existing in the gastro-intestinal membrane as an objection to the use of purgatives; but it should be borne in mind that there is also great caution requisite in their exhibition in inflammation of the peritoneal coat of the intestines, since rest of the part inflamed is a most important element in the rational treatment of such disease.

Next in order to purgatives, as evacuants in the treatment of inflammation, are emetics: these in the first instance effect, as regards the stomach, the same object as purgatives do, in regard to the intestines; they remove matter, which being lodged there, would increase the irritation, and moreover interfere with the action of other remedies; but, beyond this, several emetics, as antimony, ipecacuanha, and colchicum, produce a depression which is often very efficacious in the commencement of an inflammation. This may be well illustrated by the effect of a full dose of tartar emetic, or of that drug combined with ipecacuanha, in arresting the progress of the inflammation of the tonsils, termed cynanche. There is, it is believed, some danger to be apprehended in certain instances, from the possibility of an injurious determination of blood being excited by the act of vomiting. The danger from this cause in inflammatory affections in the cranium, has probably been exaggerated; but, on the other hand, when we suspect a tendency to venous congestion, it certainly ought not to be disregarded. The same caution is likewise applicable to venous congestion within the chest, especially when arising from organic disease of the heart.

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* (1.) ℞ Pulv. jalapæ, gr. xv.
Hydr. chlorid. gr. iij.
Misce. ft. pulv. stat. sumend.

(2.) ℞ Magnes. sulphat. ʒ iij.
Tinct. sennæ, ℥j.
Vin antim. pot. tart. m. xv.
Infus. sennæ, ʒ x.
Aq. carui. ℥ ss.
Misce. ft. haust. post horas 4^{or} sumend.

Although the use of diuretics has been regarded by many as nearly confined to the attainment of one object, namely, the consequent increase of absorption for the removal of dropsical effusion, they may, nevertheless, be employed as important adjuncts to other remedies, in reducing inflammatory action. In order to make this apparent, we should call to mind that not only do the kidneys, as has been already explained, remove from the blood its redundant water, and with it in solution, all excess in the salts of the blood, and such soluble matters as have been absorbed from the alimentary canal, but have undergone no change in the extreme circulation; but that they also eliminate highly-nitrogenized substances, *e. g.*, urea, urates, &c., the products either of the metamorphosis of tissues, or of "imperfectly assimilated food;" so that not only may free diuresis, where it can be procured, diminish effusion arising from inflammation as well as from other causes, but also promote the removal from the blood of matter which, if retained, will, by furnishing an additional source of irritation, tend to keep up or even to aggravate any existing inflammation. There is, however, reason to believe that some diuretic substances can effect even more than this: thus water, which is, perhaps, the simplest of all diuretics, accelerates the removal of all the above-named impurities from the blood, by furnishing an abundance of the solvent, if it does no more. This action of water may often, where the kidneys are healthy, be promoted by what may be termed the direct or stimulating diuretics, the agency of which depends upon their stimulating the kidneys, probably by being carried to them after having been taken up into the circulation; of this class are the vegetable diuretics, squill, broom, juniper, guiacum, digitalis, &c. These substances are very useful in exciting the action of the kidneys, increasing the flow of urine, though sometimes (and this is more especially the case when there is inflammatory excitement in the system) they fail in producing the result for which they were administered, owing to their over-stimulating the secreting organ, and by the congestion thus produced impeding its function. Nitric ether, and the neutral salts of the alkalis with mineral acids, have probably much the same agency, but are less liable to the same objections; but there is another class of diuretics which are especially applicable in inflammation, "which include the alkalis, their carbonates, and their salts with such acids as in the animal economy are capable of being converted into carbonic acid, including the acetates, tartrates, citrates of soda and potass."* These remedies, besides stimulating the excreting function of the kidneys, and increasing the volume of urine voided, actually increase the metamorphosis of tissues, and consequently the quantity of the solid contents of the urine.

Now if we add to these facts another equally well known, namely, that the alkalis and their carbonates powerfully dissolve albumen, and then decompose it into various secondary substances, we can perceive at once, that this class of diuretics affords a means, of reducing the quantity of solid contents in the blood, more particularly of albumen, which may be turned to account in inflammations in which other more depressing evacuants may be deemed inexpedient, or in which they have already been carried as far as was consistent with prudence. Without, however, pursuing this subject further at present, it may be well to remark, that in practice, diuretics have been found useful adjuncts to other evacuants in the treatment of inflammation, and, as such, have long been used by practical men, though the principles upon which their efficacy depended, and the rules according to which they should be selected, may not have been very clearly apprehended. There is another principle according to which diuretics will be found especially serviceable in inflammations of the lungs and their appendages, and of the liver, namely, that the kidneys are in some measure auxiliaries to those great depurating organs, and have a kind of compensatory action to them, so that not only may an increase in their action, diminish the ill effects which would arise in the system generally, from the imperfect depuration of the blood, through disease of the above-named organs, but also diminish the amount of function required to be performed by them, and thus favour the condition most essential to the recovery from acute inflammation, namely, rest.

The next kind of evacuation is diaphoresis, or sweating. The effect of diaphoretics in inflammatory complaints is not, as Dr. Alison observes, easily referred to any fixed principle; and in those cases where a free perspiration is speedily followed, or attended by, alleviation of the symptoms of inflammation, we cannot readily determine whether the diaphoresis was in any way a cause of the subsidence of the inflammation, or only the effect of it, or of some other cause, which it shared in common with that subsidence: there may, again, be diaphoresis in many inflammations, especially of serous membranes, without any alleviation of the symptoms; but there are also other inflammations, chiefly those of the mucous membranes, and perhaps, also, some of the secreting organs, as well as rheumatic inflammation, in which a free diaphoresis, maintained for several days, is evidently beneficial; so that we must be guided by the nature and seat of the disease, in our expectation of relief from sudorific medicines; but, as a general rule, it should be borne in mind that in the active state of any inflammation, it is inexpedient to make use of diaphoretic remedies, of which the action is attended or preceded by any vascular excitement—a caution which is particularly applicable to the premature and indiscriminate use of the warm bath in the inflammatory diseases of children.

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* *Vide* Lectures on Materia Medica, delivered before the College of Physicians in 1848 by Dr. Golding Bird; published in the 'Medical Gazette.'

Another class of remedies used for depressing the action of the heart and blood-vessels, comprises those medicines which are termed sedative; of these, perhaps, the most important is the tartar-emetic, or potassio-tartrate of antimony. Whether indeed its depressing effect upon the circulation is altogether independent of its nauseating action, may very well be questioned; but it cannot be denied, on the other hand, that the former is often very considerable when the latter is very slight, and may frequently be continued long after it has ceased. The use of the tartar emetic for this purpose was first practised many years ago in this country; but was carried to a much greater extent by Rasori, an Italian physician, who prescribed as much as from 10 to 120 grains in the course of the twenty-four hours. In this country, however, it is seldom found that much more than from half a grain to a grain can be given at a dose, without exciting some degree of nausea, and it has not generally been deemed expedient to push it much further; but even thus used it produces, in addition to the nausea, a diminution in the action of the heart and arteries, sinking of the pulse, paleness, softness, and moisture of the skin, and often a great relief to the symptoms; and is, therefore, a powerful adjunct to other measures, in many inflammatory diseases. It is found to be specially beneficial in inflammation of the lungs and of the mucous membrane of the lungs and air-passages; also of the kidneys, when its use is not contraindicated by sickness; and in the commencement of inflammation within the cranium, particularly in those cases where there is high delirium, without sickness. It is, of course, not eligible in inflammatory affections of the alimentary canal, but is sometimes very useful in those of the bladder and urinary passages.

There is some difference in the explanation given by authors as to the manner in which antimony exerts its influence on inflammations. Dr. C. I. B. Williams supposes it to act by reducing the tonicity of the arteries, though this can hardly be its sole effect; since the pulse, under its influence, becomes smaller as well as softer, which would not be the case if the contractility of the arteries were diminished, whilst the force of the heart's action remained the same. Laennec, who was one of the first to advocate its use in very large doses, at one time supposed that it acted as a revulsive or counter-irritant upon the mucous membrane of the stomach; an opinion, however, which he subsequently abandoned, and which, if true, must be received as an argument against its use, rather than in favour of it. Judging from its effects, we should be led to the opinion that it acts as a sedative to the whole vascular system, reducing the injecting force of the heart, and, consequently, the fulness and volume of the pulse—diminishing the contractile force of the arteries, and, as a consequence, the hardness of the pulse. The result of these two modes of action must be to reduce the force by which the blood is driven into the distended capillaries, and enable them to clear themselves by their own contractility. So far, the action of antimony upon the heart and arteries does not differ materially from that of the abstraction of blood, and the immediate consequences are nearly the same, since it sometimes produces a great depression of the heart's action, which, when it does occur, is more to be dreaded than the syncope from bleeding, as it is the result of the saturation of the system by a poison. On the other hand, we can, by carefully-regulated doses of antimony, maintain a sedative influence upon the heart for a much longer time than would be safe, or even possible, by repeated abstraction of blood. So that, while antimony, in the so-called "heroic" dose is, to say the least, a substitute for blood-letting more dangerous than blood-letting itself, it may often, in moderate doses, be used with great advantage where the loss of blood would be ill borne; and used in the same manner after the abstraction of blood, it is a very serviceable agent for maintaining the effect produced, and thus obviating the necessity for the repetition of the bleeding.

Digitalis is another powerful means of depressing the activity of the circulation, and may therefore afford some assistance in the treatment of inflammation: it should, however, be used only as an adjuvant, and when there is an unusual quickness of the pulse, more particularly in pulmonic inflammations. It is doubtful whether digitalis acts upon the heart *directly*, or *mediately* through the capillary system; but whatever be its mode of action, it is certain that its agency upon the circulation is entirely of a depressing character, and that one great objection to its employment, is, its being a cumulative poison, which may sometimes be taken in moderate quantities for a considerable time with apparent impunity, though at last it acts as if the whole had been retained in the system, and was taking effect in one overwhelming dose.

Colchicum is another sedative to the vascular system, the action of which appears to be, in the main, similar to that of digitalis: though it is believed, and not without reason, to have moreover a specific effect upon gouty and rheumatic inflammations: it is also liable to the same objections as digitalis in the treatment of common inflammations, against which we possess other and safer remedies.

Amongst the agents acting as sedatives to the vascular system when the inflammation is near the surface of the body, is cold. This remedy, according to Dr. Alison, causes constriction in the dilated vessels, and prevents those congestions and stagnations of blood, which seem to be essential to the inflammatory process. In order, however, to be effectual, it must be applied continuously, and for some hours together, otherwise its use will be followed by a reaction of the circulation of the part, and a return of the inflammation with increased intensity. When the inflammation is severe and extensive, it is difficult to do this without risk of the injurious effects of cold upon the system; and where it is of a character liable to metastasis, this remedy cannot be applied without great danger. There is, however, one class of internal inflammations in which it has been esteemed as peculiarly beneficial, viz., those situated within the cranium.

It has already been stated that, associated with inflammation, and probably as a part of the inflammatory process, is great nervous excitement or irritability. This is little if at all subdued, and in some subjects even increased, by bleeding; or, if diminished for a time, it is apt speedily to reappear and aggravate the disease. For counteracting this irritation, opium is especially serviceable, and is, therefore, applicable to those cases in which the inflammation is attended with much pain, and where the nervous irritability, together with an apparent feebleness of the circulation, or poorness of the blood itself, seems to contra-indicate further depressing measures. In the commencement of inflammation it is rarely used as the principal remedy; but combined with calomel and antimony it constitutes one upon which the greatest reliance is placed in this country. It is, however, but rarely admissible in inflammations within the cranium, and also in thoracic inflammations there are special cautions to be observed in its exhibition.

The various other nervine sedatives, conium, hyoscyamus, &c., hardly require a special notice in reference to the treatment of inflammation; they are indeed often valuable auxiliaries, but are employed chiefly to allay the irritation, so as to give time and opportunity for the action of other remedies. It may be right to add, however, that conium and hyoscyamus, especially the latter, are most useful in many inflammatory diseases in children, particularly those of the encephalon.

One other medicine remains to be considered, the value of which in the treatment of inflammation, though apparently overlooked by most continental physicians, is highly appreciated by British practitioners, and that medicine is mercury. It is not indeed to be denied that its usefulness, like that of all other medicines, has been at times greatly exaggerated, or that it has sometimes been indiscriminately applied, so that, the misapplication has been followed by the most disastrous consequences; still, when proper regard is paid to the character and period of the inflammation as well as to the state of the system generally, it will be found to be one of the most efficient of our remedies.

As regards the action of mercury and the best forms for its administration, it is sufficient for our present purpose to state that mercurial preparations have the effect, especially when administered in repeated doses, of increasing the secretion from the salivary glands, the liver, the mucous membrane of the intestines, and probably from the pancreas and kidneys also, and in so doing, they cause an increased flow of blood to those organs, and hence it has been proposed to explain its action, in the earlier stages of inflammation, upon the principle of derivation, though it is more probable that at this period it is chiefly serviceable as an evacuant.

It is, however, when given in repeated doses, and when the inflammatory effusions are taking place, that it exerts its greatest influence, either for good or for evil, upon the progress of the disease ; for the effect of mercury is an inflammation of a particular or specific kind, the gums becoming swollen, or, as it is termed, spongy, under its influence, and after a time, ulcerated. This inflammation is in fact of an aplastic character, tending to suppuration and ulceration, and consequently favouring the effusion of corpuscular rather than of fibrinous lymph, or when lymph is effused promoting its degeneration rather than its organization. It must be apparent from this, and from what has been already said of the subsequent progress of inflammatory effusion, that the effect of mercury, carried so far as to produce ptyalism, or an approach to it, must be beneficial or the contrary, according to the constitution of the patient and the seat and character of the inflammation, since it may in some cases bring about that amount of degeneration which is most conducive to the reabsorption of the diffused matter ; but in others it may hurry on this degeneration to an extent rendering the effusion incapable of being absorbed, and therefore fit only to be expelled from the system by suppuration and ulceration :

and again—as we have seen that the effect of the inflammation upon the pre-existing tissues is to diminish their vitality, and favour those degenerations in them, which we have spoken of as liable to occur in the new matter;—it must follow, that mercury, by accelerating such changes, may cause the destruction of those tissues into which the inflammatory effusion has taken place.

The action of mercury is not, however, limited to any particular tissue, but under its influence, nutrition languishes and absorption proceeds more rapidly. It produces, moreover, marked effects upon the blood itself, diminishing the quantity of the red corpuscles and probably that of the fibrine also, and it is possibly in this manner that it determines the formation of the less highly-vitalized corpuscular lymph in preference to the more highly-vitalized fibrinous lymph. It may indeed be objected to this view of the action of mercury, that granulations form and ulcers heal under its influence, though this objection is rather apparent than real, for such ulcers have commonly a hardened base and edges, so that the vessels supplying the granulations may have been strangulated by plastic matter, the material of such induration.

It is not, however, as a simple remedy that mercury is most used, or is most efficient in the treatment of inflammation; when it is combined with opium, and, if there be nothing to contraindicate it, with antimony, it constitutes a new one specially applicable to the treatment of many forms of inflammation; for, whilst, as we have already seen, the mercury exerts a peculiar influence upon the capillaries, and probably upon the blood as well, the antimony has a sedative action upon the heart, reducing the force, by which the blood is propelled to the part and the inflammatory action maintained. The opium acts not only in preventing the mercury from running off by the bowels, but also as a sedative to the nerves. By this combination, then, we are furnished with, perhaps, the most efficient of internal remedies for the treatment of inflammation of serous and fibrous tissues, and also of the parenchymata of viscera. The best mode of exhibiting it is after having bled the patient to approaching syncope, (where the nature of the disease and his general condition appear to justify such a measure), to administer one of the pills in the formulæ (3) (4)*; when the skin is harsh and dry, and the bowels not irritable, the draught (5) may be administered in the interval. The quantity of the

* (3.) ℞ Hydrarg. chlorid. gr. ij.
Opii, gr. ss.
Antim. pot. tart. gr. ¼.
Conserv. ros. q. s. Misce.
Ft. pil. 4ta, vel 6ta, quaq. hora sumend.

calomel as well as of the opium may, however, be varied according to the particular circumstances of every case. It will generally be found, after this plan has been continued until the gums become slightly affected, that the constitutional symptoms and the signs of the local disease begin to subside: sometimes, indeed, this will take place without any evidence of the specific action of the mercury.

From what has been already said it must be apparent that when we have reason to apprehend that the inflammation is of a destructive rather than of a plastic character, the use of mercury, if not altogether laid aside, is to be diminished, and its effects upon the system, as well as upon the local disease, carefully watched. For the same reason, we must use it more cautiously when the inflammation attacks a tissue, in which it is likely to give rise to puriform effusion, than when it affects those which ordinarily pour forth plastic lymph: thus in inflammations of the mucous surface it must not be used so freely as in those of the serous membranes, of the areolar tissue, or of the parenchymatous viscera. There are also certain states of the system in which there is a diminished power of throwing out plastic lymph, of which a remarkable instance is afforded in the tuberculous or scrofulous diathesis. As this want of power often depends, in great measure, upon the deficiency, in the blood, of fibrine and red corpuscles, especially the former, mercury is to be used with the greatest caution, since by its tendency to aggravate the constitutional fault it favours the unhealthy and destructive action which inflammation in such constitutions is peculiarly apt to assume. In those also, in whom there exists the condition of the blood already described under the term anæmia, there is an extreme susceptibility of the action of mercury, whether the anæmia be spontaneous, or whether it be the result of loss of blood, of other discharges, or of visceral disease; in such subjects, not only is there the greatest danger of the inflammation assuming a destructive character under the influence of mercury, but also is its specific effect upon the mouth and gums apt to take place with the greatest violence, leading to excessive salivation, ulceration, sloughing, and necrosis of the

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(4.) ℞ Hydr. chlorid. gr. ij.
Opii, gr. j.
Antim. pot. tart. gr. $\frac{1}{4}$
Conserv. ros. q. s. Misce.
Ft. pil. 4ta, vel 6ta, quaq. hora sumend.

(5.) ℞ Antim. pot. tart. gr. $\frac{1}{6}$.
Liq. ammon. acetat. ʒ iii.
Mist. camph. ℥ v. Misce.
Ft. haust.

jaw-bones; but even where there are no signs by which we might suspect the intolerance of mercury, we sometimes find furious salivation set up by very moderate doses, and sometimes when we do suspect this intolerance we are compelled to run the risk of its consequences rather than let an inflammation proceed uncontrolled which has resisted other means, or in which they would be inapplicable. A vast number of remedies have consequently been suggested for checking salivation; purging and blistering behind the ears are undoubtedly of service for this purpose, and the various astringent gargles are useful in ordinary cases, as those of alum, or what is better, of alum, bark, and myrrh (6); * the chloride-of-soda (7) † gargle is also to be recommended when there is a very offensive fœtor. That of brandy with an equal quantity of water, recommended by Dr. Watson in his lectures, is perhaps the best of all where the flow of saliva is excessive, and the soreness of the gums very great. Very destructive sloughing, which sometimes ensues, will however be often best counteracted by bark and wine and the use of some stimulating application, such as the gargle of nitric acid. (8) ‡

We have hitherto made no special mention of the use of counter-irritants in the treatment of inflammation, though they have been casually alluded to in speaking of metastatis, and one of the modes by which they act was noticed in connection with bleeding under the term derivation. The object, then, of counter-irritation is to imitate this metastatis, and make it available for the purpose of cure by transferring to the surface, an inflammation which is going on in some deep-seated part or internal organ. It must, however, be remembered as a most important rule in practice that this mode of relief cannot be attempted in every stage of the inflammation with equal chance of success, or safety to the patient. At the very commencement of an inflammation, especially if it be of the kind termed intercurrent, that is to say, supervening in the course of another disease, we often obtain a considerable mitigation of pain, and sometimes check the inflammation, by the appli-

* (6.) ℞ Aluminis,
Tinct. myrrhæ,
Mellis ros. āā ʒ j.
Decoct. cinchonæ cordifol. ℥ xiv. Misce.
Ft. Garg.

† (7.) ℞ Liq. sodæ chlorinat. ʒ vij.
Aq. distillat. ʒ vij. Misce.
Ft. Garg.

‡ (8.) ℞ Acid nitrici, xxiv.
Aq. distillat. ℥ viij Misce.
Ft. Garg.

cation of some substance capable of quickly exciting one which shall be superficial, and likely afterwards to subside speedily by spontaneous resolution. Beyond this however it is highly inexpedient to employ counter-irritation till a more advanced period—until, in fact, the fever has in some measure subsided, and the local inflammation is assuming a more chronic character, or is passing into a state more nearly approaching passive congestion, or has given rise to some of its characteristic exudations ; for if it be employed too early, the additional inflammation excited by the counter-irritant accelerates the heart's action, and perhaps, too, increases the inflammatory condition of the blood, and may thereby aggravate the primary disease ; but if it be done after the skin has become cooler and more moist, and the pulse less frequent and softer, it will generally happen that a great mitigation of the symptoms ensues, and in many forms of inflammatory effusion, as for instance, into the pleura, there is no more effective measure towards its absorption than the application of a blister. In chronic inflammation, on the other hand, counter-irritation is almost always applicable.

When we wish to relieve the pain of an inflammation not attended with much effusion—when, in fact, the nerves seem principally involved—such counter-irritants as produce a considerable effect upon the sentient nerves are to be preferred ; *e. g.*, what are commonly termed rubefacients : when, again, we wish to restrain or remove inflammatory exudation, a counter-irritant causing considerable effusion under the cuticle is to be preferred, the vesication being afterwards healed as speedily as possible, and the vesicatory repeated after a short interval in the same or a neighbouring part. When again we wish to check suppuration and ulceration of a chronic character going on in an internal part, those counter-irritants will be best fitted for our purpose which keep up a discharge of puriform matter. If there is chronic inflammation, producing the slow effusion of lymph or serum, or some perversion of nutrition, as in the cases of chronic inflammation with thickening of serous or fibrous structures, or chronic changes in parenchymatous viscera (*e. g.*, the earliest stages of phthisis pulmonalis), the best mode of counter-irritation consists in the repeated or continuous application of substances which stimulate the nerves and vessels, without producing any great vesication. When, indeed, such change is suspected to be going on with great activity, counter-irritation of such a nature as to produce a considerable puriform discharge is sometimes serviceable, as setons and issues : not so much on account of the discharge itself, as the revulsive action of the hyperæmia, accompanying that discharge.

Thus far we have made no mention of a most important class of remedies in the treatment of inflammation,—namely, stimulants; not from any disposition to underrate their efficiency when applied to fit cases or at the proper period; but because they are in their action and in the indications for their employment, almost opposite to the remedies of which we have hitherto spoken. If, indeed, depletion be placed at one end of the scale, stimulants should occupy the other. Bearing this in mind, we shall not act inconsistently in applying to the use of stimulants rules the same in principle as those which we have laid down for the employment of venesection. We must still keep in view the objects—1st, of inducing, if possible, the resolution of the inflammation; and 2ndly, if that cannot be effected, of leading it to a favourable termination.

Now, in those cases to which bleeding appears to be applicable we have endeavoured to explain that, its efficacy depends, in the first instance, upon a diminution of the force and frequency of the heart's action, by reducing which, we counteract one of the causes by which the increased afflux of blood to the inflamed part is maintained; and we have further endeavoured to point out that it is to counteract this increase, and to obviate its effects in aggravating or keeping up the inflammatory action, that bleeding is to be recommended, and not from any belief in its being a remedy generally applicable to inflammations as such, still less from any expectation of its removing the fibrinous or other exudations to which it has given rise. When, therefore, the increased force does not exist, there is no reason for the use of bleeding. We have further endeavoured to show, that this increased force is not to be measured by a jet into the artery —which may be the result rather of a defect in the tonicity of the latter than of an increase in the injecting force, and which is characterized by a full but compressible pulse—but by the increase in the resisting tonicity of the arterial tunics, which is characterized by a hard and incompressible pulse. When, therefore, cases of inflammation present themselves, in which the pulse, though quick, is very compressible; and still more if it be small as well as compressible (though we attach much the more importance to its ready compressibility than to its diminished volume), not only is the abstraction of blood to be abstained from, but stimulants may be administered from the first. Such cases frequently occur; more so in inflammations of some tissues than of others; more frequently in some localities than in others; and, lastly, more generally in some seasons or cycles of seasons than in others. We do not, therefore, advocate the use of stimulants as a remedy for inflammatory diseases, simply as such, any more than we would recommend the universal adoption of bleeding upon the same grounds, but because a disturbance of the balance of the circulation is one of the causes by which the inflammatory action is kept up, so we would recommend the use of bleeding or of the opposite remedies, stimulants, according as the action of the heart and resisting power of the arterial tissues is excessive or defective; since either condition must tend to maintain that local hyperæmia upon which the persistence of the inflammatory action in great measure depends. The principles will, we trust, receive further elucidation when we come to speak of special inflammations.

VII.

TYPHOID, SCROFULOUS, TUBERCULOUS, AND MALIGNANT DEPOSITS.

Closely connected with the subject of inflammation, and generally the result of one of the varieties of that process, are certain morbid products which show a very low degree of organization throughout their whole progress. These constitute a class of pseudo-plasmata of Vögel and other authors, which, in their molecular structure, as well as in the concomitant local phenomena, are closely allied to ulceration. It is characteristic of this class of deposits that they do not commonly remain local, but appear simultaneously on several parts of the body, owing probably to the same cause, which gave rise to the first pseudo-plasma, becoming repeated in its vicinity or in a distant part of the body. It is to this disposition in the morbid action to repeat itself, rather than to any essential difficulty in the healing of the cavities and ulcers, caused by these depositions, that the extensive destruction, which they often produce, is mainly to be attributed.

These deposits we proceed to describe under the name of—I. The typhoid deposit,—II. The scrofulous deposit,—III. Tubercle,—a classification which is here adopted as most convenient for the purposes of practical medicine.

"The period which elapses between the deposition and the softening of these deposits, or epigeneses, is very different in individual cases; it may vary from a few days or weeks to several months. In general the softening extends to the enclosed normal tissues, and the united product opens for itself a passage and is discharged externally. An ulcer is thus formed: this either spreads by the continuance of the original process (new deposition with softening) in the surrounding parts until it terminates in death, or the ulcer heals by cicatrization, whilst the loss of substance is repaired by permanently-organized epigeneses. In other cases the softened mass does not become discharged, but is gradually resorbed, and the loss of substance is repaired by a similar cicatrization to that which occurs in the preceding case. Sometimes the reparation is interrupted by the deposition, instead of softening, becoming converted into an earthy or cretaceous mass, and thus forming a concretion."*

I. In most cases of that variety of fever to be described hereafter as typhoid, pathological deposits take place in different parts of the body, most frequently in the intestinal canal immediately underneath the mucous membrane, and above all, in Peyer's glands near the termination of the ileum, more rarely in the spleen, in the lungs, and in the trachea. These formations consist, at the commencement, of yellowish or whitish masses, of different degrees of consistence, deposited amongst the normal tissues, which, together with those tissues, undergo the process of softening and ulceration above described, and either heal by cicatrization or continue until the death of the patient.

These deposits consist—1, of an amorphous stroma or floor to the ulcer; 2, of minute molecular granules, sometimes interspersed with fat globules; 3, of imperfect cells or cytoblasts. These three elements are present in very uncertain proportions, the granules, however, being generally in excess. When softening takes place the amorphous matter disappears, leaving the granules and cells suspended in a fluid; the softening mass frequently containing unsoftened particles of considerable size, which become isolated by the disorganization of the surrounding parts, and are thus discharged as agglomerate masses.†

II. The scrofulous deposits occur in that state of the system commonly known as the scrofulous diathesis, or scrofulosis, and in their elementary composition bear an exact resemblance to the preceding; the only difference being their mode of deposition, which takes place much more slowly and under a different condition of the system. They exhibit, however, great variations in their anatomical structure, being sometimes dense and firm, sometimes lardaceous, and sometimes soft and friable. Like the typhoid matter, they consist of an amorphous stroma, granular matter, and imperfect cells or cytoblasts. Softening does not, however, always ensue in scrofulous deposits, but, in many, the calcareous deposition becomes predominant, and the result is an earthy concretion.‡

III. The most important, however, of this class of deposits is *tubercle.* This word was at one time very indiscriminately applied, but more lately the attempt has been made to restrict it to certain pathological exudations, the result of a specific morbid tendency termed tuberculosis; though perhaps sufficient care has not been taken to establish the proposition that tuberculosis is *always* the cause and not the effect of tubercles.

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* Vögel's 'Pathological Anatomy,' by Day, p. 271.

† Vögel, opus citat.

‡ Ibid.

Tubercles are described by Dr. Carswell as consisting of a pale yellow, or yellowish-gray, opaque unorganized substance, and there is much truth in this description, with the exception of the term *unorganized.* The fact is, that tubercles are unorganiz*able*, that is to say, incapable of any higher degree of organization, but they are not on that account unorganiz*ed.*

Tuberculous matter is composed of different elements occurring in different proportions, but corresponding essentially with those of the typhous or scrofulous matter already described: these are, 1, a transparent, amorphous, vitreous stroma, occurring in large masses, and closely resembling coagulated fibrine; 2, minute molecular granules, occurring in masses of a brownish colour; some of these appear to be modified protein compounds, others consist of fat, and some of calcareous salts; 3, imperfectly-developed cells and cytoblasts, with or without nucleoli; the degree of organization of the tubercle depending upon the prevalence or deficiency of these cell formations.*

"With respect to the origin of tubercle there can be no doubt that its formative substance is secreted from the capillary vessels, in a fluid form, in the same manner as the typhous matter; and it afterwards fills up all the interstices of the tissue in a manner too perfect to be accomplished by any substance which was not originally fluid. Probably this secretion results from the same causes as that of fibrinous effusion generally, and *is preceded by a local hyperæmia of the participating capillaries.*" †

It has been said that the different elements of tubercle occur in very different proportions, and this difference gives rise to what have been termed the varieties of tubercle. Thus we have the gray semi-transparent tubercles of the size of millet-seeds, with fibres and nucleated cells; and the opaque, crude, or yellow tubercles, in which we do not find even these traces of definite structure, since the matter of which they consist is altogether granular; between these we have every possible gradation depending upon the different proportions of the cell formations—the fibrinous matter or stroma—and the granular matter. It is here, indeed, that the gray tubercle in the progress of its development approaches more nearly to the yellow, from the increase in the proportion of granular matter: but there can be no doubt also that the granular matter may preponderate from the first, since we often meet with the yellow tubercle, in apparently the very earliest stages of development.

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* Vögel, opus citat.

† Ibid.

Of the elements of which these tubercles consist, the amorphous stroma is always present from the first, as are generally the granules; but the imperfect cells make their appearance later, and appear to be the result of an abortive attempt at organization.

Tubercles rarely remain stationary as to development, though of some, consisting of the semi-transparent stroma, the progress is often for a long time very slow; but the ordinary course of these bodies is to soften, which is brought about by the softening of the fibrinous matter or stroma, by which the cells and granular matter being set free, make a sort of emulsion with fluid formed or secreted in the disintegration of the fibrine. This process of softening and disintegration is not, however, confined to the tubercular matter, but the tissues, in which that matter has been deposited, are involved in the same disorganization, and break up, more or less rapidly, according to the nature of each; and the product of their disorganization mixing with that of the tubercle, we have a thick apparently puriform matter consisting of an organic *débris* saturated with serous fluid. This mass has generally a tendency to make its way to the nearest cutaneous or mucous surface, like the pus of an abscess. In some few cases the fluid becomes reabsorbed, leaving some of the tuberculous matter as a compact mass, in the cavity formed by the destruction of the tissues: this matter sometimes undergoes a species of fatty degeneration, in which case it is probable that it also may be reabsorbed and the cavity cicatrized.

In other cases, again, the calcareous matter, which is generally present in greater or less proportion in the granules, continues to increase; and the other matters being removed by absorption, the tubercle becomes converted into a white chalky mass generally surrounded by a dense cicatrix.

There may exist every variety in the mode in which tuberculous matter is deposited relatively to the surrounding parts. It may be deposited in nodules of various sizes, constituting what are commonly termed tubercles, and which, when very minute, yet at the same time distinct and visible to the naked eye, are known as miliary tubercles. In other cases the tuberculous matter is diffused through the tissue of the whole or greater parts of an organ, constituting what is commonly termed tuberculous infiltration. It is not, however, always easy to draw the line between these forms of tuberculous deposit, since they merge into each other by almost insensible differences, and frequently we find every gradation coexisting in the same organ. It often happens, too, that we find other pathological formations, such as pus cells or fibrinous exudations, surrounding the tubercles; these are possibly the products of the disorganization of the tissue in which the tubercle has been deposited, or the result of the irritation excited in that tissue, by the tubercle acting much as a foreign body. It is remarkable that these formations at the surface of the tubercle are not influenced by the nature of the deposit, or, in other words, they are not assimilated to it; a circumstance in which tubercle differs essentially from the more highly-organized pathological formations, described under the term malignant, and which possess in a high degree this power of assimilation, exciting the cytoblasts in their immediate neighbourhood to a similar development. As the extension of the tuberculous deposit, which almost always takes place, depends upon its continual deposition (arising from the as yet unexplained cause, the tuberculous diathesis), and not upon any controlling influence exercised by the tubercles themselves, the cavity produced by the softening of a mass of tubercles may heal; and therefore the cure of any of the tuberculous diseases of different organs, to be hereafter described, is not a pathological *impossibility*, although the arrest of the disease is rare, owing to the tendency to this continual deposition.

Of the real nature of the tuberculous deposit we indeed know nothing except by its effects, though "its presence is, in a great number of instances, marked by external and unequivocal signs, although they appear under two conditions so different that nothing but the fact of their frequent association with scrofulous disease would lead us to consider them as marks of a similar condition of the body. In one we find what may truly be called the sanguineous temperament; the fair complexion, light hair and eyelashes, blue eyes, slender form, long fingers, and contracted nails, fine, white, and regular teeth, or in the male, the ruddy complexion, with the hair and whiskers inclined to red, and with this there is associated a peculiar liveliness, activity, and susceptibility of mind. In the other we have the dark and swarthy complexion, perhaps the opaque white skin, with black eyes, long dark eyelashes and dark hair, the thick upper lip, and often a more sturdy form, short fingers, and nails wide and large, with the slower intellect and less energetic disposition."*

This diathesis is further characterized by the manifestation in early life, often in infancy and childhood, of a tendency to certain diseased actions: thus in such persons we find enlarged glands in the neck or groin, chronic inflammation of the mucous membranes, especially of the conjunctivæ and of the lining of the air-passages; the tendency to the formation of small vesicles often about the angles of the mouth and behind the ears, constituting the "sore ears" of the nursery; a liability to livid chronic inflammation of slight wounds. The pulse, too, in persons of this constitution is commonly frequent, the heart irritable, the veins large and often conspicuous through the transparent skin. Young children, in whom there is a strong scrofulous tendency, have frequently a softness of bone, rendering them rickety, often rather large heads, of which the fontanelles and sutures are slow in closing, tumid abdomens, or narrow chests: they are also very excitable, and have frequently a precocity of intellect.

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* Bright and Addison's 'Elements of Medicine.'

The most frequent cause of the tuberculous diathesis is a congenital and hereditary predisposition, which predisposition is, of course, far greater where the tendency has previously existed in the families of both parents, and shows itself in the greatest intensity in the offspring of marriages between relations in whose family the taint has already existed. There is, however, no doubt that it may be favoured and even induced, by circumstances and habits of life which tend to diminish the plastic powers by exhausting the nervous energy and impoverishing the blood; and even if it be doubted that tuberculous disease can be set up by such conditions in a subject previously untainted, there can be no doubt that parents inheriting no tuberculous taint may, under such circumstances, induce a state of constitution which, if it do not, in this way, manifest itself in themselves, will most assuredly do so in their offspring.

Although we are unable to determine the essential character of the tuberculous diathesis, and the causes to which it owes its origin in the first instance, we are nevertheless able to state with tolerable confidence certain circumstances or conditions which favour its development. Of these the chief are, 1, Climate; 2, Age; 3, Mode of life; 4, Employment; 5, Diseases.

(1.) As regards climate, it is certain that tuberculous diseases are, upon the whole, more frequent in cold than in warm ones, though we are not to ascribe this solely to the influence of the former in inducing the tuberculous diathesis; but, as we shall presently see, in part, to its exciting that diathesis into activity in particular organs. Indeed, a warm climate appears in many instances to encourage a susceptibility to tuberculous disease, since we often see persons—young persons more especially—who have been brought from a warm to a cold climate, become in consequence the subjects of tuberculated lungs. On the other hand, the same facts prove the greater power of a cold climate in calling this diathesis into activity when there exists the slightest liability to it. The combination of cold and wet, especially if it be associated with sudden changes of temperature, seems beyond all other conditions of climate to promote the formation and also the development of this diathesis.

(2.) As regards age, there is, perhaps, no period of life which is exempt from the invasions of tuberculous disease; it may attack even the *fœtus in utero*, and instances are not wanting of its occurrence in extreme old age. Childhood, youth, and early manhood are, however, most liable to it, so that we find by far the greatest number of cases of tuberculous disease occurring between the ages of 2 or 3 and 35.

As regards the remaining circumstances which favour the formation of the tuberculous diathesis, we may lay it down that they do so in so far as they are opposed to healthy nutrition, and consequently all circumstances which interfere with the digestion and assimilation of the food, and the due elaboration and depuration of the blood, must of necessity tend to this result.

A deficient or innutritious food must obviously have this effect; and although a vegetable diet may, under some circumstances (as in a tropical climate, for instance), be sufficient for health, yet it may be stated, as a general rule, that a diet deficient in animal food, especially during childhood and youth, is one of the circumstances which predispose most strongly to scrofulous disease. Scanty or unequal clothing, again, has the effect of impeding the uniform and regular distribution of the blood, and consequently favours local congestions, especially of internal organs, which not only accelerate the deposition of tuberculous matter in those organs, when the diathesis exists, but also (according to the rule laid down), by impeding the functions of those organs which are for the most part concerned in the elaboration of the blood, must aid in inducing the diathesis itself.

There are, however, other conditions in the mode of life which affect the establishment of the tuberculous diathesis even more perhaps than diet or clothing, amongst which may be mentioned over-fatigue, want of proper exercise, of pure air, and of light. Now these are circumstances which it is impossible to estimate separately, since they are evils which commonly affect collectively the poorer classes in large towns; certain it is that they seem to have a much greater influence even than privation; for among the rural population, where the latter cause is in nearly, or even quite, as active operation, the mortality is far less than among that of crowded cities, where there is, in addition, the want of pure air, and of free exposure to the solar ray; and the increased number of deaths in the latter case occurs mostly among children and young persons, and is very greatly owing to scrofulous disease. It does not appear, however, that sufficient importance has been attributed by authors to the latter cause, namely, insolation, in controlling the development of disease.

The above causes act most powerfully in early life, and their effects may be strikingly seen in children bred in the dark, ill-ventilated, and ill-drained dwellings of the poor in crowded cities; so much so, that it is not too much to affirm, that were they not, as is commonly the case, replenished by fresh importations from the country, the inhabitants of such places would, in a few generations, become extinct by scrofula.

The same tendency is increased by the debility following many diseases, especially fevers and great evacuations, which may be really said to *impoverish* the blood by diminishing the quantity of red globules and fibrine; and by none is this brought about more readily than by venereal excesses and the pernicious habit of masturbation in either sex.

Depressing mental emotions, as disappointment and anxiety, favour the scrofulous diathesis, whilst, on the other hand, the same tendency is counteracted by pleasing emotions, gentle mental excitement, regular exercise in pure air, and the habit of regular employment.

Having now glanced at the circumstances, which induce or favour the formation of the scrofulous or tuberculous diathesis, we may make a few remarks upon those, which excite it into activity, or, in other words, promote the deposition of scrofulous deposits in particular organs; and we may lay it down as a general rule, that *where the diathesis exists the tuberculous deposits will be most likely to take place in any organ, at the time when its vascular and functional activity are the greatest;* and accordingly we shall find, that when, from age, climate, or other circumstances, an increased afflux of blood is directed upon any organ, then, if there exist the previous tendency, scrofulous disease will be most apt to develop itself in that organ.

Thus, in infancy, the size of the head is large in proportion to the rest of the body, the abdomen holds a middle place in this respect, and the chest is the least developed of the three. As childhood advances the trunk increases in a greater ratio than the head; but at this period the abdomen is much more developed than the chest, and it is not till youth or early manhood that the latter acquires its full size in proportion to the rest of the body. In nearly the same order do we find that tuberculous disease attacks these different regions. It cannot be denied that in infancy and early childhood the brain is more frequently the seat of tuberculous disease than at any other period of life, whereas in more advanced childhood we find that tubercles evince a greater partiality for the abdominal viscera; but it is not till youth or early manhood that the lungs, which are nevertheless in the aggregate peculiarly obnoxious to tubercles, acquire their full liability to them. On the same principle we find that the presence of tuberculous matter is very common in the spleen in children, in whom, from their extremely active habits, that organ is frequently liable to great sanguineous engorgement. Further, it has been observed that tubercles are scarcely ever found in the organs of reproduction before the age of puberty, though their occurrence after that period (that is, after those organs have attained their maximum of vascular and functional activity) is by no means infrequent. In the intestinal tube, again, tuberculous disease is a common occurrence, and it is worthy of notice, that in the majority of cases it is confined to the lower portion of the ileum and the caput cæcum coli, parts of the canal which appear, from their being most frequently the seat of hyperæmia and mucous inflammation in the course of other diseases, to be peculiarly susceptible of vascular excitement.

The effects of climate, in favouring or counteracting the deposition of tubercles in the lungs, will afford another illustration of the same law, since it is in colder climates that there is the greatest demand for the function of respiration, and consequently the greatest functional activity and most rapid flow of blood through the lungs; and the increase of such activity, occurring when animals or human beings are removed from a warm to a cold climate, might be expected to act still more powerfully upon lungs, which have been less developed from a less performance of function; and this is found to be a circumstance peculiarly favourable to the deposition of tubercles in these organs. This, however, is a question that will require a fuller consideration in connexion with the subject of phthisis. It may, however, be well here to cite the words of Dr. Alison, that it is a " well-ascertained fact that masons, miners, needle-grinders, and other artificers who are in the habit of very frequently inhaling irritating particles, are peculiarly liable to scrofulous phthisis."

From what has been stated it is evident that tubercles may be deposited, independently of inflammation, and also that inflammation may occur in subjects, in whom that deposit already exists—and that too around the tubercles, and in their immediate neighbourhood, without the effused matter assuming the form of tubercle—whence we infer that there is no necessary connexion between inflammation and tubercle; at the same time it is also evident, from the circumstance of the tubercular deposit being generally promoted by an increased afflux of blood to the part so affected, that inflammation, by inducing such an afflux, must have a tendency to excite the formation of tubercles.

It must be apparent from the description already given, that the occurrence of inflammation in scrofulous subjects cannot be too cautiously guarded against, and therefore a most important consideration in the management of such subjects, is the prophylaxis or previous guarding or fortifying the patient against it (from *προ* and *φυλασσο*, I guard or defend): for this purpose two objects are to be kept steadily in view: 1, the obviating the morbidly-defective vitality of the blood with deficiency of fibrine, which appears to be one of the fundamental conditions of the scrofulous diathesis; and 2, the removal of all circumstances, which tend to excite inflammation, or local congestion. The general principles, upon which the first of these objects is to be pursued, will be readily understood, from what has been said of the circumstances favouring the development of those conditions, which constitute the scrofulous diathesis: the particular application of these principles will be more appropriately considered, when treating of special diseases.

The second of the above objects will be most likely to be attained by not only avoiding the ordinary causes of inflammation, but also by paying particular attention to those circumstances and conditions, which have been already pointed out as favouring, at the same time, the occurrence of congestion, and the development of tubercle in scrofulous subjects, and adopting measures to obviate them.

When, however, inflammation does occur in such subjects, it must be met by early treatment, according to the principles already laid down, since it is of the first importance to prevent it going on to produce any of the inflammatory effusions, which, under such circumstances, are not merely apt to assume an unorganizable character, but often tend to prevent the nutrition of the surrounding textures. It unfortunately happens, moreover, that these effusions do most commonly take place, either in the form of the cheesy matter already described, the white granular albuminous matter, or tubercle: and since the effusion of these matters is not controlled by the same constitutional remedies, which check the effusion, or promote the absorption, of lymph in ordinary inflammation, but is rather aggravated by them, and the consequent disorganization of the surrounding tissues accelerated, the same antiphlogistic treatment cannot be persisted in; and all measures, which, by lowering the powers of the patient, and impairing the vitality of the blood, may be supposed to favour suppuration or ulceration, should be shunned as soon as there is reason for believing that any of the above deposits are taking place; and a tonic or even stimulating treatment adopted; the means for reducing inflammation being restricted almost entirely to counter-irritants.

It is perhaps after the more acute inflammatory action has subsided, and when the above deposits are taking place, that iodine, or rather the iodide of potassium, is peculiarly serviceable: its power of preventing the suppuration of these tubercles is, to say the least, very questionable; but if it do not actually effect the absorption of the albuminous deposit, it checks its effusion probably by its influence in improving the condition of the blood.

New Growths and Malignant Deposits.—Analogous in many respects to tubercle are those growths or deposits to which the term malignant is applied by surgeons, and which are in common parlance styled cancers. These deposits, when truly malignant or cancerous, are not the result of any change or degeneration of the normal tissues of the body, but constitute, as it were, a superfluous addition to them. They are, therefore, often spoken of as *malignant growths.* But here a question often presents itself as to whether all, or what growths are malignant, a difficulty which is, no doubt, of more practical importance to the surgeon than to the physician: and, accordingly, tumours have been by them divided into malignant and innocent. But still the difficulty remains, that some are of doubtful character, and present qualities which belong as much to the one as to the other. In order to solve this difficulty, or, at least, to estimate it, it is necessary to premise that growth may be either physiological or pathological. Thus the term growth is used to express the renovation of the tissues, which is continually going on through the system: this is physiological growth. It may, indeed, sometimes occur to an abnormal extent, giving rise to the enlargement of an organ or a muscle, as when one kidney becomes enlarged through the increase of function which it may be called upon to perform through the destruction of its fellow, or the muscular walls of the heart become thickened from obstruction to the exit of the blood from its cavities. This, though excessive, and so far abnormal, is conservative, and may therefore be called, physiological. It sometimes happens, however, either from purely local disease or injury, or from a constitutional cause, that the plasma or exudation, by which any part is nourished is poured forth in excess, and a tumour is the result. This tumour, or new growth, is essentially morbid. It differs, too, from normal or physiological growth in this, that in the latter every structure produces like, whereas in the morbid process the identity is lost between the original tissue and the new formation, and consequently development is impossible, except into a structure of the simplest kind.

We cannot illustrate this subject better than by adopting the exposition given by Dr. Wilks in his admirable 'Lectures on Pathological Anatomy.' "When," says that most accomplished pathologist, "a blastema proceeds from any part, whether the cause be purely a local one from injury, or have altogether a constitutional origin, its tendency in the soft tissues is merely to develop into the most elementary forms; but even within these narrow limits the greater the tendency to develop, and not to remain as a simple structure, the nearer the approximation to a healthy state, and the more innocent the character of the growth. Thus in most of the softer structures of the body the main constituents of adventitious deposits are cells and fibres of various forms and combinations, the purely cell structure being analogous to cancer, and malignant; while the fibrous shows a tendency less malignant."

"Supposing now that, owing to some morbid condition of a part, a blastema or plasma is thrown out, which shall fibrillate, a simple fibrous tumour is produced; in this, however, nuclei may be found, and thus various combinations of simple fibre and nucleated fibre may exist together. Of this kind are fibrous polypi, wens, various cutaneous hypertrophies, &c. . . . .

"Now suppose, again, this plasma should form nuclei and cells, and these should rapidly be reproduced, and have no tendency to fibrillate, a large mass of useless structure is seen, which can receive no other name than cancer. These cells, I believe, are not peculiar, but are simply embryonic cells, which are continually being produced without any object, and therefore display a vicious or malignant condition of system. . . . .

"Now, for a third time, suppose an intermediate condition—a plasma which forms cells, having a disposition to change into fibre, a tumour is produced, which is seen to be composed of rapidly-growing nucleated fibres. . . . . These are styled recurrent or malignant fibroid."

These constitute the three great divisions of tumours—innocent, malignant, and semi-malignant; but they pass into one another, and various grades of them, no doubt, exist. Thus cancer, or the cell-growth, for instance, is divided into scirrhous and medullary: the former being hard, and the latter soft, or resembling a piece of brain, whence its name, encephaloid—being a vascular, soft structure, giving out a milky juice when squeezed. These two forms do exist, but at the same time the hardness or softness of a cancer depends very much upon the texture of the organ in which the adventitious deposit takes place.

The most rapidly-growing cancer is the medullary, and this, when of the acute form, is soft, and often contains nothing more than nuclei. If the cells should have a tendency to sprout out, and if the plasma fibrillates into a firm matrix, the tumour is necessarily harder, and a scirrhous cancer is produced. This is of a slower formation, and less malignant than the medullary. The fibrous and fibro-nucleated tumours, as before mentioned, are innocent; but the recurrent fibroid are of a semi-malignant character.

All these varieties of malignant disease are, as has been already stated, the effect of some constitutional taint or vice in the system, and it is upon this that their malignancy mainly depends; so that when one of these tumours is removed by the knife, a fresh cancer will arise sometimes from the same spot, though it may not necessarily be the same form of cancer, thus evidencing the connection between the three different varieties of that disease. In other instances the same, or one or all of the varieties may be found to coexist in different organs of the body.

These growths always go on increasing in size, sometimes slowly, as in the case of the scirrhous; at others, as is commonly the case with the encephaloid variety, with uncontrollable rapidity, involving and destroying contiguous textures, breaking out into hideous ulcerations, and finally destroying life, either by involving some vital organ in its progress, but more commonly by asthenia through pain and exhaustion.

As to the origin of cancer little is known, though there can be no doubt that it is in many instances hereditary. In a case of cancer of the liver which occurred in the practice of the author, a lady was the fifth victim to the disease in two generations.

When once a cancerous spot has been detected in any part of the system, there can be no doubt that it will increase, and that it will be propagated to other parts, generally, along the course of the veins and absorbents, most frequently the former, the channel along which the germs of the cancerous growths are conveyed being the current of the circulation. Thus the true cancer in the stomach often gives rise to cancer in the liver, the former being much more rarely found without the latter, than the latter without the former; and cancer of the kidney has been traced along the cava to the right auricle.

From what has been said, it must be apparent that where the situation of the cancer is such as to admit of extirpation by the knife, the only chance of the operation being permanently successful is afforded by its being performed at the earliest possible period. Unhappily, we know of no remedy which has the power of arresting or controlling the progress of cancerous growths, though there have not been wanting, especially of late, those who have pretended to the possession of one; of such persons the best defence is their ignorance.

We have already spoken of the strong hereditary tendency of this disease. We do not say that it would be right to forbid those from marrying in whom this hereditary liability may be supposed to exist, but we would strongly dissuade the unions of persons so circumstanced, and between whom there might be any consanguinity. That the disease may be propagated by inoculation is now pretty well ascertained; local irritation, as of a decayed tooth affecting the tongue or lips will sometimes excite it in the predisposed. These facts suggest obvious precautions. We would not assert that cancer is an inflammatory product, but think it but reasonable to apprehend that; given the cancerous diathesis, inflammatory exudation would be very likely to become the nidus of such a deposit, and even that afflux of blood to any part from undue stimulation would be likely to determine the development of the disease in that part. All causes of inordinate irritation or excitement of those organs in which cancer is likely to appear should therefore be guarded against as much as possible. This remark may apply to the mouth, pharynx, and œsophagus; to the stomach, liver, and intestines; to the testicles and prostate gland. The disease sometimes attacks those who are to all appearance in perfect health; yet we can hardly doubt that a maintaining the vigour of the system must be amongst the best means of guarding against its attacks, more particularly as it more frequently makes its attack when the constitution has been impaired by disease or other causes.

In addition to the deposits and growths which have been described, there are other adventitious substances which may be diffused through the organs or tissues. Of these, the more important are lardaceous, or waxy matter, and fibrous tissue. Of the latter we have already spoken.

"Lardaceous matter is," according to Dr. Wilks, "a peculiar translucent albuminous matter poured out into the tissues, and is one of the simplest and most lowly organized substances which is ever produced in the human body: it is thus met with in tuberculous persons, and those suffering from cachexia infiltrating their various viscera. If there should be a disposition to cell formation, some of these bodies might be formed; but which, shrinking or becoming abortive as soon as produced, a tuberculous mass results."*

This lardaceous matter Dr. Wilks evidently regards as closely allied to tubercle on the one hand, and to cancer on the other; the morbid plasma, in the latter instance becoming the nidus of perfect cells; so that, according to this pathologist, we may have all these affections, tubercle, cancer, fibroid tissue, and lardaceous matter, passing by insensible degrees into one another.

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* 'Lectures on Pathological Anatomy,' p. 471.

VIII.

HÆMORRHAGE AND DROPSY.

If congestion do not speedily subside, or go on to inflammation, it is commonly followed either by an outbreak of blood from the congested part, constituting hæmorrhage, or, by an effusion of its colourless portion only, constituting dropsy.

Hæmorrhage.—This term is applied indiscriminately to all effusions of blood, whether internal into the cavities and viscera of the body, or external, upon the surface, or from external wounds or ulcers. It may also take place from the injury or giving way of a large vessel; or it may proceed from a large number of minute or even capillary vessels, as is ordinarily the case in hæmorrhage from mucous surfaces or superficial ulcers. Hæmorrhage from large arteries may indeed take place within the cavities of the body, as occurs when an aneurism of an artery, or any vessel otherwise diseased, suddenly gives way; and in such circumstances hæmorrhage from large vessels may fall within the province of the physician, and not unfrequently does so; though by far the greater number of such cases are beyond the control of art. Hæmorrhages of this kind may be fatal, either by the direct effect of the loss of blood upon the system, or through the injury, and obstruction to its functions, of the organ into which the blood is effused. Thus the bursting of an aneurism, or the opening of a large vessel by ulceration, either in the cavities or in the extremities, may produce speedy death by syncope: but, on the other hand, the giving way of an artery in the brain may cause death by coma, and rapid hæmorrhage into the substance of the lungs, death by apnœa.

When, however, as happens in the majority of those cases with which we are concerned, the hæmorrhage is the result of either of the forms of congestion of which we have before spoken (p. 29), the blood flows from a large number of capillary vessels, and may, like the congestion of which it is the sequence, be either active or passive.

We cannot, however, here pass over a difficulty which meets us *in limine* in the consideration of hæmorrhage, whether active or passive—Is it possible for blood (that is, the whole blood) to escape from capillary vessels without rupture of the walls of those vessels? We are assured, by the most expert minute anatomists, that there is a physical impossibility in the transudation through the walls of capillary vessels, of blood including red corpuscles: since, whilst these corpuscles vary from the size of $\frac{1}{2000}$th to $\frac{1}{4000}$th part of an inch, and are no inconspicuous objects under a microscope of very moderate power, the pores of the vessels, through which it has been assumed that they transude, are not to be detected by the aid of the most powerful instruments. We know, however, that in active congestion, for instance, red corpuscles find their way freely into vessels which before only admitted the colourless part of the blood, and that, apparently, without any change in the size of the corpuscles themselves; and we also know that in disease the constituents of the blood may undergo great changes as to form and consistency: we ought, therefore, to be slow to admit the absolute impossibility of the transudation of the whole blood in capillary hæmorrhage. On the other hand, again, it has been ascertained that in most instances of hæmorrhage by apparent transudation, innumerable lacerated capillary vessels have been detected in those tissues from which it has occurred.

Practically speaking, this is a question of little moment, though it is of great importance to bear in mind that the greater number of hæmorrhages from internal organs are from the capillaries; generally, no doubt, by laceration of numbers of these minute vessels; and that when we are told of a patient having broken a blood-vessel on the lungs or stomach, the probability is, not that a large vessel has given way, but that there has been an escape of blood in the manner just pointed out.

There is, however, one important exception as to the mode in which hæmorrhage takes place in internal organs; that is, in regard to the brain. Hæmorrhage within the cranium is almost always from rupture of a considerable vessel, rarely—very rarely—there may be capillary hæmorrhage upon the surface, or in the substance of the organ.

These hæmorrhages often prove, as it were, a vent for the congestion of which we have already spoken as their antecedent, and thus relief is given to the original disorder; though, on the other hand, they may proceed to such an extent as to become themselves formidable diseases.

We have a notable instance of hæmorrhage purely physiological in the case of menstruation, in which the discharge is consequent upon a normal periodic congestion, and followed by relief to the feelings of tension and oppression by which the presence of that congestion is evinced; and we learn from pathology that when the flow of blood is arrested it frequently happens that the pain and tension indicating the congestion continue: or, again, it sometimes happens under such circumstances that the pain and fulness manifest themselves in parts or organs far removed from the uterus or ovaries; which symptoms are often followed by hæmorrhages from such parts, showing that a congestion and hæmorrhage in one part may, as it were, supersede a congestion or hæmorrhage in another; a fact which has a most important bearing upon many points, both in the causation and the treatment of congestion and hæmorrhage. Now there are many hæmorrhages which cannot be called physiological, since they do not belong to a state of health, but of which the sequences exhibit precisely the same phenomena as do those of the normal or physiological hæmorrhage. In some persons, hæmorrhages of this character—hæmorrhoids, for instance—recur at nearly uniform intervals, and not very unfrequently assume a monthly period, so as to suggest the notion of a male menstruation. The sudden subsidence or suppression of one of these abnormal hæmorrhages will, like that of the normal menstruation, be succeeded by some derangement in the health generally, presenting the form of a congestion elsewhere; which, like the congestions consequent upon the suppression of menstruation, leads to further disorder, unless it be relieved by a vicarious discharge from the part thus secondarily affected.

These sudden and somewhat inexplicable temporary metastases of congestion and hæmorrhage from one part to another are suggestive of the applicability of revulsion or counter-irritation; that is, of an attempt to relieve congestion or hæmorrhage in any part where it may be dangerous, by exciting a congestion, or, if necessary, a hæmorrhage in another part, where it will be comparatively innocuous. Hæmorrhage, like congestion, may be active or passive, and the active form of hæmorrhage is (except in the case of solutions of continuity involving arteries of considerable size) the consequence of active congestion. It is not, however, so generally true that passive hæmorrhage is the consequence of passive congestion, for although, when passive congestion is followed by hæmorrhage, that hæmorrhage is generally of the passive character; yet there are hæmorrhages of not unfrequent occurrence, which are not the sequences of any congestion whatever, and must be ascribed either to disease of the capillaries themselves, whereby they become easily lacerable, and admit of extravasation, or, what is probably a more frequent cause, change in the blood itself, whereby the hæmatosine becomes dissolved in the liquor sanguinis, and capable of transudation through the walls of the capillaries.

Active hæmorrhage being, as we have said, a consequence of active congestion, is often preceded by those symptoms which usher in the latter; namely, general chilliness, the effect of afflux of blood to a particular part or organ, and consequent diminished flow through the rest of the system; subsequently there may be reaction, with the full and bounding pulse which we have spoken of as belonging to active congestion; and here, recurring to what we before stated, we may have a subsidence of the symptoms, either spontaneously, or under the use of remedies—or hæmorrhage, dropsy, or inflammation occur. If hæmorrhage, the blood is commonly poured forth quickly, and its eruption is generally followed by a relief to the local tension which preceded it; the natural temperature of the extremities is restored, the pulse becomes less full and frequent, and the patient feels free from oppression. It may indeed, and sometimes does, happen, that the capillaries which have thus given way under increased distension, do not recover their contractility, and blood continues to be poured out to such an amount as to threaten death from syncope.

Passive hæmorrhage belongs generally to an opposite condition of system, and presents itself to our notice most commonly in persons of impaired constitution, or who have been reduced by improper or insufficient food. It is not preceded by any constitutional febrile symptoms, neither is it followed by the sense of relief resulting from active hæmorrhage. Hæmorrhages of this class sometimes occur without any appreciable disease of the organ from which they proceed, and may be regarded as idiopathic; that is to say, they are the results of disease of a general rather than of a topical character; its manifestation in a particular part or organ being brought about by some slight determining cause, such as accidental excitement or irritation, or by some previous susceptibility in the organ itself. The greater number of passive hæmorrhages are, however, the consequence of passive congestion, resulting from disease of the organ itself, or from mechanical congestion: in such instances it is not so much a disease, as the effect and symptom of a previous disease; and is, in the majority of cases, not to be dreaded so much on its own account as for the disease of which it is the sign. Still it sometimes happens that through the giving way of a vessel of considerable size, death from syncope may ensue.

In all cases of hæmorrhage the symptoms will vary much, according to the part from which it takes place. There are, however, some which it is well to bear in mind as belonging to hæmorrhage in general: such are—pallor; a feeble, loose, compressible pulse; cold extremities, and impending syncope, followed often by a feeble vascular reaction, the pulse becoming larger and sharper, but still loose, and very compressible. These symptoms have been sometimes referred to the alarm excited by the appearance of the blood, especially when it is coughed or vomited up in large quantities; but though that alarm may not be without its influence, the symptoms are often present when the blood has not made its appearance externally, but has been retained in the lungs, stomach, bowels, or other internal organs or cavities. It is, too, upon this account that the above symptoms are important, since when they present themselves without any other assignable cause, and particularly if they have been preceded by rigors and sense of internal tension, or by those special symptoms which will be hereafter pointed out as indicating hyperæmia or congestion of any internal organs; we may suspect the occurrence of internal hæmorrhage.

The special diagnosis of hæmorrhage will be more appropriately treated of when we speak of the diseases of particular organs, but we may here remark, that even when the blood escapes by the natural outlets of the body, it is not always so easy a matter as might at first be supposed; since when blood flows from the mouth there is often much difficulty in determining whether the source of the hæmorrhage be in the larynx or trachea, or whether it be in the stomach or œsophagus: to say nothing of large vessels which might open into any of these parts; and if it be passed by urine, it always requires care to ascertain whether it proceed from the urethra, bladder, or kidneys; and similar difficulties present themselves when the blood is passed by stool.

It is also of great moment in many cases to determine whether the hæmorrhage is of an active or passive character. When much blood has been poured forth, as shown by the chilliness, clammy perspiration, and loose, compressible pulse, even though it may not have been discharged from the system (and still more if it have escaped in any large quantity), we must, for practical purposes, regard the hæmorrhage as passive, and deal with it accordingly. But there are other instances in which the blood appears only in quantities insufficient to produce any general effect upon the system, and in which it becomes of great importance to determine its true character; that is to say, whether it is the result of an active or passive hyperæmia of the part, or of mechanical congestion. Under such circumstances, much will depend upon the detection of disease, in other organs, likely to produce mechanical congestion of the part which is the source of the bleeding. Such, for instance, are the evidences of disease of the heart when the blood proceeds from the lungs, or of disease of the liver when it is from the stomach or bowels; but besides this there will be the general condition of the patient, his previous plethoric or anæmic condition, and perhaps, above all, the condition of the circulation. In order to appreciate the latter, we must attend carefully to the obvious and easily investigated, but nevertheless often unheeded or misinterpreted, signs afforded by the pulse. When there is a sthenic condition of the circulation, and consequently when there is a probability of active hæmorrhage, the heart's action is forcible, and so, also, is the antagonistic force of the arteries. The pulse, though it may not be full or bounding, is always of moderate volume and incompressible, provided there has not been sufficient loss of blood to diminish the powers of the circulation. When there is idiopathic hæmorrhage of an asthenic character, the pulse from the first, though it may be of fair volume, is easily compressible, though the quantity of blood lost may have been quite insufficient, of itself, to produce any effect upon the circulation.

In those cases of internal hæmorrhage which are the effect of mechanical congestion, the consequence often of disease of some other organ, as in hæmorrhage from the lungs arising from disease of the heart, or hæmorrhage from the stomach from disease of the liver, we may often be led to a knowledge of its true cause by some symptoms which suggest the nature of the primary affection. Thus, in the former instance, we shall probably have irregular action of the heart, with other signs of disease of that organ; and in the latter, the previous history and habits of the patient, signs of functional derangement of the liver, or palpable enlargement of that organ.

We should be anticipating much that will require to be detailed hereafter, were we to enter further into the special causes of hæmorrhage; but it is hoped that enough has been said to render intelligible the general principles of its treatment.

The first question which must suggest itself to the mind of the careful practitioner is, whether it is expedient to arrest the hæmorrhage, assuming that it is in his power to do so.

The answer to this will turn upon the evidence which is afforded of the nature and cause of the hæmorrhage. Where there is good ground for believing that it is of an active character—the result, that is to say, of an active congestion—it is most inexpedient to arrest it by any direct means; such as powerful astringents, either applied locally or administered internally with a view to their entering the circulation: for, as has been already pointed out, the hæmorrhage is commonly followed by a subsidence or diminution of the congestion which induced it, and which, if not thus relieved, would probably lead to inflammation or structural change. It must not, however, be understood that the bleeding is to be allowed to go on, without any effort to restrain it, to such an extent as to cause danger of death by syncope; but merely to such an extent as we may reasonably suppose to be curative or conservative: this may be estimated by the effect upon the pulse, and the absence or presence of the signs of impending syncope.

The same rule applies even more forcibly to habitual hæmorrhages, since not only might we prevent the relief which nature is thus affording to the congested part, but also incur the greater danger of causing a transference or metastasis of the hæmorrhage itself to some part or organ where it would be more than doubly dangerous. Thus, for instance, the suppression of hæmorrhoids, epistaxis, or profuse menstrual discharge, would be dearly bought at the expense of extravasation in the brain, or even into the lungs, stomach, or intestines.

In such cases, although we may not endeavour by direct means to stop the flow of blood, we may have recourse to such measures as are likely to obviate the general plethora, or the local congestion which is the cause of the hæmorrhage. In all active hæmorrhages, at the time of their occurrence, and (in those who are liable to their periodic return) still more in the intervals between their recurrence, we must endeavour, by enforcing temperance and the use of a generally antiphlogistic regimen, and guarding against those circumstances which appear to promote the local congestion, to obviate both the general plethora, and the local determination which is the immediate cause of the hæmorrhage. Care must also be taken to insure a regular action of the skin, the kidneys, the bowels, and, through the latter, of the liver; since nothing tends more to promote irregularities in the circulation, and consequent local determinations, than the suppression of any of these evacuations, though a similar danger may not unfrequently be incurred by excess of any of them. Disturbance of the respiratory function is also conducive to local congestion; and, therefore, not only is it expedient to avoid all such exposure as in this climate notoriously sets up disease of the respiratory organs, but also many indulgences which induce a proneness to such disease, and susceptibility of the influence of its causes; such are indolence, the living in heated rooms, and the frequenting overcrowded, or overheated, places of public resort.

As regards the direct means of arresting hæmorrhage, considerable stress has been laid upon venesection by several authors; and there can be little doubt that in the commencement, while the pulse is firm, and but little compressible, the abstraction of a moderate amount of blood may diminish the force of the heart's action, and at the same time act as a revulsive. On the other hand, it is only under such circumstances that blood should be taken from the arm, and these but rarely present themselves. When, however, there is active hæmorrhage, with tolerable force in the pulse, local abstraction of blood by cupping may more often be had recourse to. This measure is less likely to depress the powers of the system, or be followed by a dangerous reaction, and is more likely to be beneficial as a revulsive agent by producing a metastasis of the congestion. For the latter purpose dry cupping is often serviceable. Another important agent in repressing hæmorrhage is cold, which both acts as a sedative to the heart, and also causes contraction of the extreme vessels. Caution must, however, be observed in its application, especially in internal hæmorrhage, lest it induce syncope by too greatly depressing the action of the heart, already lowered by the hæmorrhage. Mercury is a remedy not without its uses in some forms of hæmorrhage, though it should not be forgotten that its beneficial effects can be only secondary —that is to say, that when it aids in arresting hæmorrhage, it does so by relieving some congestion which had been the cause of the bleeding, rather than by any direct influence upon the bleeding vessels. Neither should it be forgotten that mercury, like abstraction of blood, tends to aggravate the effect of hæmorrhage in diminishing the quantity of red corpuscles.

As in congestion, so in hæmorrhage, free evacuation by the natural outlets of the body is among our most efficient remedies; and, as has just been observed, it is probably in this way that mercury may be beneficial. Purgatives are serviceable, not only when they act as hydrogogues, and thereby diminish the volume of the circulation, but also as revulsives, by determining the blood to another part of the system, and thereby inducing, as it were, a favourable metastasis of the congestion which has been the cause of the hæmorrhage.

Many cases, however, present themselves in practice in which the hæmorrhage is not a mere consequence of an active congestion, and one (within due limits) affording relief to the primary disease, if it do not absolutely constitute a cure; but, on the contrary, it is in itself a formidable disease, not relieving the primary congestion, which, rather, seems to become more fully established as the hæmorrhage proceeds. In such cases recourse must be had to the important class of remedies termed astringents. A large number of the articles of the materia medica are too often indiscriminately classed under this head. We may, however, here observe, that amongst those drawn from the mineral kingdom there is much difference in their action upon the system. As regards the metallic preparations, those of iron, amongst the astringent preparations of which we may reckon the sulphate and the sesquichloride, are indicated in cases where there appears to be an anæmic state of system, and where the action of the heart is languid, and the pulse compressible. They are, however, contra-indicated when there is a tendency to plethora, when the pulse is firm, or even when we have reason to apprehend much local congestion.

Next to iron we may place copper in the order of tonic astringents: it is not, however, so frequently used in copious hæmorrhages; since, being less manageable, it will not be at all times wise to attempt to bring the system rapidly under its influence. Arsenic may perhaps be placed in the same category with copper, and the same objections apply to it in a still greater degree, though it is not without its uses in some forms of passive and what might be, not inaptly, called chronic hæmorrhages. Nitrate of silver is of nearly the same class. The salts of zinc, which are astringents of considerable potency, and, at the same time, tonics (especially the sulphate), hold an important place in the order of metallic astringents, since they do not, like the salts of iron, either accelerate the circulation or promote the formation of red corpuscles. Some practitioners suppose that they even diminish the quantity of the latter, as lead undoubtedly does: they are, however, powerful tonics, and do not depress the circulatory or nervous power: whereas the salts of lead, amongst the most efficient of which is the acetate, not only lower the action of the heart, and diminish the nervous power, but at the same time, if they do not diminish, certainly stop the formation of red particles. Still the potency of lead in arresting pulmonary and uterine hæmorrhage cannot be denied.

The mineral acids, again, are astringents of a tonic character, and of these the sulphuric is perhaps both the most tonic and the most styptic. Alum, again, is a most efficient astringent from the mineral kingdom, nearly allied to zinc in its therapeutic action.

The vegetable kingdom furnishes a large number of astringents, among which must be reckoned krameria catechu, cusparia matico, cinnamon, tormentella, gall-nuts, and various others, which nearly all owe their efficiency to the gallic acid which they contain.

Dropsy.—Another consequence of congestion is dropsy, which has also been sometimes regarded as one of its terminations; though, as we have already had occasion to point out, it ought rather to be received as one of the accidents of that complicated process, and an effect of the congestion which necessarily attends it.

By dropsy is meant the presence or accumulation in any of the closed cavities, or in the areolar tissue of the body, of water more or less charged with the solid ingredients of the serum. Authors of deservedly high authority qualify this definition by the restriction that the effusion be independent of inflammation. There are, however, so many instances in which accumulations of fluid, which all agree in calling dropsies, are the consequence of undoubted inflammation, and others in which it would be next to impossible to affirm that it was in no degree owing to it, that we are inclined to regard the restriction as inconvenient.

Some authors, indeed, and amongst them the late Dr. Blackhall, to whom, perhaps, next to Dr. Bright, we are indebted for the discovery of the connection between this disease and albuminous urine, regarded inflammatory dropsies as constituting one class of such affections.

Dropsy may consist either of effusion into any of the closed cavities of the body, as the ventricles of the brain, the pleuræ, the pericardium, or the peritoneum, constituting hydrocephalus, hydro-thorax, hydro-pericardium, and ascites. These, when they occur separately, are often the direct effects of inflammation, or the remote consequences of the change produced by it in a serous membrane. Again, there may be an effusion of watery fluid into the areolar tissue of the body, constituting anasarca: this sometimes affects the whole system, varying in its seat, or in the amount to which it affects different parts, according to the position of the patient; thus the legs may be swollen towards the end of the day, when the erect or sessile posture has been maintained; but in the morning, when the recumbent one has been preserved through the night, the face will be puffy; and, similarly, the more dependent arm or side of the body will be distended with fluid. This is termed, generally, anasarca; but, at the same time that there is general anasarca, there may be more or less effusion into several or all of the closed sacs: this is general dropsy. But, again, there may be swelling of a part only from infiltration of the areolar, arising from some purely topical cause: this is local œdema.

The characteristic sign of anasarca or dropsy of the areolar tissue is, that it *pits*, as it is termed, upon pressure: thus when pressure is made with the finger upon an anasarcous hand or foot, the fluid, being pressed out from the cells of the tissue, does not return to refill them immediately, and the impression remains for a time. The presence of fluid in the peritoneum is ascertained by its fluctuation, and in the cavities of the head and chest it is inferred from signs to be described hereafter, when we speak of the diseases of these regions.

Dropsies, again, have been described as active and passive. In order to make this distinction, and the grounds upon which it rests, more clearly understood, we will endeavour first to explain the mechanism, or rather the hydrostatics of dropsy.

The closed cavities of the body, as well as its areolar tissue, are lubricated or kept moist by a slight exudation of serous fluid from the surface of the serous membrane, or of the walls of the cells. Should, then, this exudation accumulate in excess, dropsy is the result. This occurrence was, according to the older physicians, the effect of an obstruction, or loss of function on the part of the absorbents. Now, not to mention that there is no proof that the action of the absorbents is suspended in dropsical effusion, since persons so affected are liable to a rapid waste of the tissues, it is well established among physiologists that the absorption of the fluids is carried on mainly, if not entirely, by the veins; and, further, that transudation or imbibition is continually going on through the coats of the veins; according to the principles of *endosmosis* and *exosmosis*, or rather, the more comprehensive laws of *heterogeneous* attraction of Professor Daniell. So that when the veins are distended with watery fluid to a certain extent, all imbibition into them from without is arrested; and that when the distension goes still further, there is a transudation of fluid from the veins into the surrounding tissue: but if, on the other hand, there be a deficiency of fluid in the veins, the transudation ceases, and imbibition commences: there is, in fact, absorption taking place. Now, upon these principles, all cases of passive dropsy may be explained. There is, in such cases, either an increase in the quantity of fluid in the veins, or the proportion of liquid in the blood is increased by diminution of its solid contents, as in cases of anæmia or spanæmia (*vide* p. 20, *et seq.*). Now, that these causes may produce dropsy has been proved experimentally. Thus Lower tied the jugular vein in a dog, and after a few hours found all the areolar tissue of the head and face distended with serum: it was œdematous, in fact. And in another experiment he produced ascites by tying the vena cava just above the diaphragm. Hales, again, injected water into the femoral vein of a dog, and the limb became anasarcous. We see, then, that these causes, venous obstruction and increased fluidity of the blood, are capable of producing dropsy. And causes similar to these are in operation in cases of passive dropsy: there may be obstruction to the return of the blood through the descending cava from disease of the heart, or from pressure upon the vessel itself by enlarged glands or other tumours, and dropsy of the face or upper extremities is the result. Obliteration of the venous sinuses has been observed in connection with effusion to the ventricles of the brain, and induration of the liver obstructing the passage of the blood through the vena portæ is a well-known cause of ascites. Again, in the chlorotic girl, and in one whose blood has been impoverished, or, in plain language, rendered "watery" by loss of blood, or other discharges, there is anasarca of the legs or depending parts; and when this state of blood is excessive, effusions sometimes take place into the serous cavities. Such are passive dropsies. As regards the active dropsies, we know of none which are not more or less inflammatory.

Take, for instance, the case of general anasarca consequent upon suddenly repressed perspiration. Thus a man was brought into Guy's Hospital some years ago who had fallen overboard two days before, when much heated, in unloading a barge: he was generally anasarcous, and had signs of effusion in the chest: his urine was scanty, and contained blood. In this case there could be little doubt that the watery discharge from the skin, which had been suddenly repressed, was taking place, by a species of metastasis, into the areolar tissue and serous membranes. This form of disease, which is not very uncommon, affords the nearest approach to active dropsy without inflammation; but, from the state of the urine, there must have been a condition of the kidneys inconsistent with a due elimination of the solid ingredients of that secretion, which, when retained in the system, would have proved irritants to the cells of the areolar tissue as well as to the serous membranes, so that it is not easy to entirely disconnect such affections from inflammation. The same remarks apply still more, perhaps, to the dropsy consequent upon scarlatina, and that associated with unequivocal renal disease. Still, for practical purposes it is very convenient to recognize the distinction between such forms of disease and the purely passive ones; the latter being produced by an increased exhalation from the capillary veins, resulting either from mechanical obstruction or from an increased proportion of water in the blood; absorption or imbibition being thereby arrested: whereas, the active dropsy is probably an effusion from the capillary arteries, those vessels being in a state of congestion closely bordering upon inflammation. It may be observed, that in renal dropsy there is, besides the retention in the system of the ingredients of urine, generally a great defect in the solid contents of the blood, and consequently a redundance of water, so that the condition of the blood induces passive dropsy in addition to the cause of capillary excitement, which may give rise to active dropsy.

Many practitioners are disposed to regard dropsy rather as a symptom than a disease; and this is so far true, that if we could remove the cause of the dropsy we should have little difficulty in getting rid of the dropsy itself: but it is not true, if it is meant to imply, that dropsy itself may not greatly imperil the life of the patient, and ought not speedily to be removed; for it may of itself prove fatal, independently of the lesion upon which it depends. And this it may do by coma, from pressure upon the brain; by apnœa, from pressure upon the organs of respiration; by syncope, from pressure upon the heart. Fluid effusion within the abdomen may greatly interfere with the functions of the viscera in that region, and also impede the respiration by its pressure upon the diaphragm; while the distended integuments of anasarcous limbs are apt to inflame, and, from the obstructed state of the circulation, to become gangrenous and thus cause death from asthenia.

As regards the removal of the fluid, much must depend upon the seat and origin of the dropsy, but at present we confine ourselves to general rules and principles.

Bleeding has sometimes been recommended for the relief of what have been termed inflammatory dropsies, in the hope of promoting absorption by emptying the veins; but when we remember its effect upon the quality of the blood, we may well fear that the abstraction of any considerable quantity of that fluid may bring it into a condition favouring transudation: it is doubtful, then, whether it should ever be adopted as a remedy for dropsy, *as such*, though it may be an admissible one for the primary tissue upon which the dropsy is supposed to depend. Other evacuants, however, are not open to the same objection, and for many forms of dropsy they are particularly applicable; thus, in the case of repressed perspiration, the exhalation being transferred from the proper surface to a closed cavity, or assemblage of such cavities, the patient may be said to sweat into this serous membrane, or areolar tissue; and the same may be said of the renal secretion; and the object must be to restore the exudation to an open surface or canal. This we may endeavour to effect by sudorifics, diuretics, and purgatives. As regards the two former, there is much difficulty often in securing their action, though diaphoretics should never be neglected; there are, also, often objections to stimulating the kidneys. Perhaps there are no remedies so efficacious in many forms of dropsy, particularly general anasarca, as active hydrogogue cathartics. Of this a curious illustration once occurred to the author. A man was admitted into Guy's Hospital, enormously distended with renal dropsy, during the prevalence of cholera in the summer of 1849. He became the subject of that disease, and profuse rice-watery evacuations flowed from his bowels in enormous quantities. At the end of two days his dropsy was gone, and after a time he left the hospital, believing himself well, though not cured of the disease upon which the dropsy depended.

The passive dropsy, depending upon excessive anæmia, will frequently yield to the use of tonics, good diet, and other measures calculated to improve the tone of the system and the quality of the blood. Those which depend upon mechanical obstruction, as, for instance, ascites from induration of the liver, are little amenable to remedies, as it often happens that disease has done its work of disorganization before the effusion commences. In such cases we are sometimes compelled to let out the fluid by paracentesis, or tapping, or sometimes the anasarca may be relieved by puncturing the limbs. These remedies, and the circumstances which require their use, will be best treated of hereafter.

IX.

RHEUMATIC AND GOUTY INFLAMMATION.

Under the term rheumatism are included several diseases, which vary in every respect except one, which is their being always painful. It is by no means improbable that these affections, which have received a common name, are essentially different. To avoid as much as possible this confusion, we commence with the unquestionable form of the disease, acute rheumatism, rheumatic fever, or, as it is sometimes called, rheumatitis.

Acute rheumatism, then, is a specific inflammation, affecting almost exclusively fibrous tissues, though sometimes extending to the surrounding structures, by contiguity. It attacks chiefly the larger joints, especially the knees, wrists, shoulders, elbows, and ankles. The external cause is generally exposure to cold, especially when producing repressed perspiration. Its internal or essential cause seems to be an abnormal condition of the blood, which contains always an excess of fibrine. It was at one time believed that there was also an excess of uric acid in the blood. Dr. Garrod has, however, shown that this does not exist. It is certain, however, that there is an excess of some acid, probably the lactic, the effect of a morbid state of the primary or secondary assimilation, or of both.

Acute rheumatism commences with the ordinary premonitory signs of inflammation, rigors, heat, thirst, restlessness, and anxiety, speedily followed by severe pains attacking the larger joints. These pains are ordinarily very severe, following much the course of the muscles, and producing such extreme tenderness that the weight of the bed-clothes can hardly be borne, and motion of an affected joint is intolerable anguish. The swollen joint is usually red and puffy ; the swelling is, however, more constantly present than the redness. The constitution in the mean time shows signs of active inflammatory fever ; the tongue is covered with a white fur ; the pulse is sharp, bounding, and not yielding readily to pressure ; the urine is scanty, highly acid, and depositing a copious latiritious sediment; the bowels generally torpid; the skin, however, is commonly bedewed with an unctuous perspiration, which has a peculiar acid odour, which it is difficult not to recognize. The inflammation, instead of running the ordinary course of common inflammation, is exceedingly erratic, sometimes seizing suddenly on a fresh part, often an internal fibrous structure, and of these the most liable to be attacked is the pericardium; the substance of the heart also is probably liable to be implicated: but, next to the pericardium, the endocardium, particularly that part of it which forms the valves of the left side of the heart, is most susceptible. The other membranes—the pleuræ, peritoneum, dura mater, and tunica vaginalis—may also be attacked. This tendency to invasion of the heart constitutes the great danger of the disease; not that it is necessary that the inflammation should leave the extremities that the heart may become affected, for the heart affection as commonly supervenes without subsidence of rheumatic inflammation in the joints as with it,—or even more so. It is not, therefore, strictly metastasis. The ordinary termination is resolution; but true rheumatic inflammation never leads to suppuration or gangrene, nor, when it is in the extremities, to adhesion; when, however, it attacks the pericardium or other internal part, it runs the same course as common inflammation. Sometimes there is a copious effusion of fluid into the synovial capsules and sheaths of tendons, especially the capsules of the knee. This difference has led to a distinction between fibrous and synovial rheumatism. The true acute rheumatism is, however, generally of the former kind, the latter being a more sub-acute form, and often a sequela of the acute.

The external cause is, as has been stated, exposure to cold, and repressed perspiration: there are, however, no doubt, some persons constitutionally liable to this disease, which also seems to prevail more in particular seasons than others; generally, but not universally, when the weather is cold, damp, and variable. The disease generally attacks young persons, prevailing most in youth and early manhood. After thirty-five it becomes less common; though cases do occur at all ages, and even young children are not exempt. It is generally believed that the tendency to affect the heart is greatest before puberty; and some have gone so far as to assert that no young persons under that age ever get through an attack of acute rheumatism without that organ being more or less involved.

The robust and plethoric, are also said, to be more liable than others, to attacks of rheumatism; though the experience of our London hospitals hardly warrants such a conclusion, since it is a common disease amongst the London poor, who are not generally very robust or plethoric; and it attacks females, and delicate females too, no less than men.

The sub-acute rheumatism, to which we have before alluded under the term synovial, is often a sequela of the acute, though it may arise primarily. It attacks the same structures, and often produces great deformity and distortion: the joints become enlarged from the effusion into the capsular ligaments; and the muscles waste. It is perhaps more common to see it affecting the smaller joints than is the case with acute rheumatism; and probably on this account it is often known by the name of rheumatic gout, and not without reason, for it is perhaps the connecting link between the two diseases. When long continued, it produces stiffness of the joints, amounting in some cases to perfect immobility, and they are distorted as if actually displaced. This is particularly the case when the disease attacks the fingers.

The above constitute the diseases to which the term rheumatism ought to be restricted. The chronic rheumatism or rheumatic pains belong to a distinct class; they may indeed have their origin sometimes in the same causes as true rheumatism, but as the former are essentially blood diseases, so the latter are essentially nervine: and therefore we shall speak of the so-called chronic rheumatism separately.

The diagnosis of acute and chronic rheumatism is generally pretty obvious—the severe pains, the swelling, the febrile excitement which accompany the former can seldom be mistaken; yet these are not to be implicitly relied upon unless the rheumatic odour be also present, since cases have occurred in which the arthritic pains and swelling, closely simulating rheumatism, have occurred as the result of irritation of the nervous centres. In one remarkable case, in Guy's Hospital, which closely simulated acute rheumatism, the primary disease was inflammation of the cervical portion of the medulla spinalis. Cases like this are of rare occurrence, but they are of great interest, as showing the possibility of a disease of nervine origin of simulating even acute inflammation; and they readily explain how the pains which are so hastily included under the term rheumatism, may be in reality nervine affections.

There is another disease which may be confounded with acute rheumatism, and possibly has not unfrequently been so, though of late years its true nature has been better understood; this is the pyæmia, ichoræmia, or puriform infection, which has been already mentioned (p. 60). In the latter disease, however, the inflammation in the joints is disposed to an erysipelatous, or even livid hue, whilst the low form of fever, which has been pointed out as associated with it, completes the distinction,

The danger of rheumatism as affecting life is in general but little, unless it attack the heart or other important internal organ; and therefore, as such an occurrence is always possible, the prognosis should be guarded accordingly. As regards the probability of perfect recovery, the same liabilities are to be borne in mind, and therefore the condition of the heart cannot be too frequently or too carefully examined. We do not here enter into details which belong more to the special consideration of cardiac disease, and will be found elsewhere: but would merely insist upon the importance to be attached to every abnormal circumstance affecting the circulation, whether it be murmur—impulse—or deviation from the natural character of the pulse. In connection with the permanent ill effects from rheumatism, we must not forget the occasional occurrence of the sub-acute form of the disease (which would be more properly termed the chronic), producing the lamentable stiffness, immobility, and distortions already alluded to.

Rheumatism is a disease often resisting the best-selected remedies, and apparently running its course unchecked; so much so, that many authors of judgment and experience have expressed their opinion, that in most cases it will, in spite of treatment, run a course of five or six weeks, and that, notwithstanding many certain and speedy antidotes. There are, however, certain modes of treatment which deserve special notice, and some upon which we believe great reliance may be placed. Here we would premise that (1) rheumatism is an inflammation; (2) that it originates in the presence of an excretory matter in the blood, produced probably in excessive quantity, through defective assimilation; and further, (3) that though a blood disease, it nevertheless involves the nerves of sensation and voluntary motion more decidedly, if not more essentially than ordinary phlegmasiæ.

Three prominent indications suggest themselves—(1) to subdue the inflammation, regarding it simply as such; (2) to eliminate the excretory matter acting as a poison; (3) to correct the mal-assimilation, and so prevent the undue formation of acid. To these may be added the specific treatment; and finally, we shall give the plan of treatment which we consider deserving the greatest confidence.

The first indication suggests decided antiphlogistic measures, and undoubtedly they are not without their use. Of these the most obvious is bleeding; and in a plethoric subject, with a strong pulse, a full bleeding at the commencement of the disease often goes a great way to arrest its progress, or at all events to render it more amenable to other remedies. But the frequent repetition of the bleeding is most objectionable: we would advise that it should never be repeated beyond a second time, if so often; since it renders the patient more liable to that terrible malady sub-acute synovial rheumatism: it is also contra-indicated by the tendency of the disease itself to produce anæmia, or defect of red blood, which is favoured by venesection. Purging is another antiphlogistic measure of considerable service; but when carried to the extent of five or six loose motions daily, it has more the character of the eliminating plan of treatment. Antimonials are useful in the same way. The great suffering, however, suggests the use of opium, which, in combination with the antimony, and a little calomel, may be regarded as an antiphlogistic means; and by these—the bleeding at first—the antimonials with salines—the opium and calomel, with a little additional antimony, the patient may generally be carried well through the disease; but, as Dr. Alison observes, "the acute rheumatism cannot probably be much shortened in its duration by antiphlogistic remedies." We may also add, that mercury cannot be relied upon as an antiphlogistic measure to the extent to which it can, in some other phlegmasiæ; and it is particularly liable to the objection that it diminishes the quantity of red corpuscles.

We have just spoken of opium, and have alluded to the extensive implication of the nervous system in rheumatism; and towards obviating excitement in, or implication of, the sentient extremities of the nerves in this disease it presents an efficient means. Opium alone, in grain doses, repeated every three hours, will sometimes cut short an acute rheumatism in a very few days, but it is hardly safe unless combined with evacuants. In the case of a sound subject, a full bleeding, a purgative, and the opium treatment will often act almost heroically.

Various specifics have been recommended in rheumatism, of these the most conspicuous are bark and colchicum. Of bark and quina it may be affirmed, that in the acute stage of the disease they are inadmissible, though when the inflammation has been subdued, and the pains have at all a periodic character, the bark and soda, or (if there be excessive perspiration without mitigation of the symptoms) quina and acids will be very beneficial though their employment is more appropriate to the subacute form.

Colchicum has, no doubt, great power over rheumatic inflammation; but it may be questioned whether this is not merely dependent upon its power of elimination, though it is also an effective sedative to the circulation. It does not, however, generally arrest the rheumatism, unless it act fully upon the bowels or kidneys, producing either the loose pea-soup-like motions, commonly known as colchicum stools, or copious rather dark urine, or both. If, however, it cut short the rheumatism by its simple sedative or antiphlogistic power, there is too much reason to apprehend the reappearance of the disease in the heart; and the belief has certainly gained ground that rheumatic carditis has increased in frequency, with the use of colchicum in the treatment of rheumatism. When this drug is used, it ought certainly to be administered in combination with some aperient, so as to secure a free action of the bowels; and there is, perhaps, no safer or more efficient form than the powder of the cormus; this should be given three or four times a day with the magnesia and salt draught (9),* commencing with about three grains, and gradually increasing the dose to five or six. To prevent excessive irritation, a grain of calomel, with one grain of opium, may be given night and morning. This treatment may be continued until either the evacuations above noticed have been produced, or the symptoms subside, or there is any irregularity in the pulse, which should always be carefully watched, as sudden and very dangerous syncope might be the result of not withdrawing the colchicum upon the first warning of this symptom. Under this treatment the inflammation will often have disappeared in the course of a week or ten days; but there is an uncertainty about the action of colchicum, depending partly upon its being a cumulative agent in the system, and partly perhaps upon a variation in the strength of different specimens, that renders it almost impossible, certainly to prevent its sudden and uncontrollable action as a poison.

One of the most ingenious methods which has ever been suggested for the treatment of any disease, is the attempt to prevent the excessive formation of acid, or at all events induce its almost immediate conversion into urea, in the extreme circulation. The agent selected for this purpose by Dr. Owen Rees, is lemon-juice, by the digestion and decomposition of the citric acid in which, he believed that oxygen would be supplied, that would by oxidating the acid, convert it into urea. He therefore recommended lemon-juice to be given in doses, which he ultimately increased to two or three ounces, three or four times a day; and in a considerable number of cases the patient has become convalescent in five or six days. It is, however, exceedingly doubtful whether the remedy has produced its effect by the chemical change suggested, or as a sedative to the circulation; certain however it is, that it has a powerful effect of the latter kind, sometimes lowering the

* (9) ℞ Mag. sulp. ʒi—ʒii.
Mag. carb. gr. xv.
Aq. menth. pip. ʒ x. Misce.
Ft. haustus.

pulse, to an extent that becomes alarming. It ought, therefore, only to be used when the patient is robust, and the rheumatism of the well-marked acute character, and it is remarkable that such are the only cases which commonly do well under its use. The powerfully-depressing effect of this remedy, and its frequent failure, as well as the fact that cardiac inflammation does sometimes arise during its employment, are drawbacks to its eligibility for the cure of rheumatism.

The method of elimination consists in the endeavour to promote excretion from the skin, the kidneys, and the intestines. The late Dr. Todd recommended its adoption in nearly the following form, which is certainly by no means an inefficient mode of treatment. Let the bowels be freely acted upon, let the patient be strictly confined to bed (which of course is assumed to be done, whatever method be employed), let the affected extremities be carefully wrapped in cotton wool, and over each a sheet of gutta percha may be placed, and let the annexed combination be given every four hours (10).*

We have already mentioned the large quantity of fibrine in the blood of rheumatic patients, and the copious deposit of urates in their urine. It is also worthy of note that this deposit is most abundant when the disease is about to subside. This circumstance suggests the notion that the uric acid thus eliminated may be the result of the metamorphosis of the redundant fibrine; a change which it is highly probable may be promoted by the salts of potash. Upon this principle, the following plan of treatment, which is also eliminant, is recommended. It is that which the author has found to be in general the most certain, as well as least liable to the objections which have been noticed as applying to the others. Let the bowels be freely acted upon by the purgative draught (2),† with the addition of about half a drachm of the compound tincture of colchicum, and, the patient being confined to bed, let the cotton wool be applied as above, and the patient be put upon the use of the draught (11)‡ every four hours. Upon this simple plan, the patient will often become convalescent within a week; about which time, the urine will generally throw down an abundant deposit of urates. This mode of treatment has the advantage that it may be continued should any internal inflammation require the use of mercury, and that it is also admissible when the disease assumes the more chronic or sub-acute form; which is not the case with the lemon-juice.

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* (10) ℞ Pulv. opii,
Pulv. ipecac. āā gr. ss.
Pot. nitrat. gr. iv. Misce.
Ft. Pulv.

† Page 101.

‡ (11) ℞ Pot. acetat. ʒ ss.—℈ ij.
Pot. nitrat. gr. v.—x.
Tinct. opii, ♏ iv.—viij.
Decoct. hordei, ℥ iss.—℥ ij. Misce.
Ft. haust.

The sub-acute or synovial rheumatism, when it follows as a sequela of the acute disease, and comes early under treatment, will in most cases yield to a course of the acetate and nitrate of potass, or in cases where the debility is considerable, the same or a larger quantity of bicarbonate may be substituted for the nitrate; and, provided there be no inflammatory symptoms, the infusion or decoction of cinchona may be used as a vehicle, to which in a short time the compound tincture may be added. In still more chronic cases, especially if there be much perspiration, the quina and sulphuric acid may be employed: in very chronic cases with much pain, the accompanying form is a good one for the exhibition of the quina. (12)* When the pain undergoes aggravations at night, whether we have or have not reason to suspect a syphilitic taint, though still more in the former case, the iodide of potassium is a most valuable remedy. In general two grains three times a day, will be a sufficient dose, but it may be increased to three or four.

Where there is much effusion into the joint, blisters will often promote its absorption, and the application of the tincture of iodine, until some irritation of the skin is produced, is a very useful adjuvant. The iodine may sometimes be used with advantage in a still more powerful way, namely, by soaking a piece of lint in the tincture, and then allowing it to remain some hours upon the affected joint.

The functions of the skin should however be steadily maintained, and, when not excessive, encouraged, and therefore the Dover's powder, or the combination of opium with nitrate of potass, given above, should be used at night, and it is chiefly by its diaphoretic action, that guiacum has obtained some confidence in the treatment of chronic rheumatism: but whilst we endeavour to promote the functions of the skin by internal remedies, we may with advantage employ warm baths: and the natural hot-waters, as those of Bath, are often serviceable.

When the chronic rheumatism is of long standing, or when it has come on without any previous acute attack, it is one of the most intractable maladies with which we have to do, and the distortions which it produces, are often permanent.

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* (12) ℞ Quinæ disulphat, gr. i.—ij.
Ext. colchici acetici, gr. $\frac{1}{4}$—gr. ss.
Ext. conii, gr. iij.. Misce.
Ft. Pil. ter die sumend.

GOUT.

Closely allied to rheumatism, yet distinct from it, is gout—a disease which was one of those the best known to the ancients under the term of podagra or foot-pain, and for which various more scientific names have been suggested, but of which none is less objectionable than that by which it is popularly known. Gout has been divided into endless varieties by different authors ; but perhaps the best, because the simplest, classification, is the division adopted by Dr. Copland into acute gout, chronic gout, and irregular gout.

An attack of acute gout is generally preceded by symptoms of gastric derangement and incipient pyrexia. These consist of restlessness—drowsiness, though with want of refreshing sleep—depression of spirits—and general lassitude : at the same time, there are pains or flatulent distension of the stomach—cardialgic pains, with sometimes acid eructations—now and then a sense of coldness in the epigastrium—the bowels are irregular, generally costive, though sometimes there is looseness ; —the tongue is also coated and the urine turbid. These premonitory symptoms, however, vary in different individuals, so that one has one peculiar feeling before an attack of gout, and another another.

Generally, after symptoms of the above character, of two or three weeks' duration, though in some few instances without any previous sign whatever, the patient is awakened some time after midnight—commonly about two in the morning—by severe pains in one of the smaller joints, often the ball of the great toe. The pain is of a severe, burning, throbbing, character, attended by stiffness. These symptoms increase, and the burning and throbbing become most intolerable ; the actual temperature of the surface becomes much increased, and the occasional shooting pains are such as to suggest the idea of the joint being pierced by hot wires, or torn by pincers ; the affected part is exquisitely tender, so that the lightest touch or most gentle movement cannot be endured. With this severe suffering there is of course great restlessness, and considerable fever, all which symptoms generally go on increasing till about six or seven in the morning, about which time perspiration begins to break out, and the severity of the pain to subside, so as in the milder cases to allow the patient to obtain some sleep. The appearance of the part shows active inflammation ; the integuments are red and swollen, often shining, and the veins proceeding from it remarkably distended. The pains generally continue mitigated throughout the day, but again return with equal or even increased severity after midnight, and continue till six or seven in the morning, when they again abate ; in very severe cases, however, there may be no remission for several days. As, in all other inflammations, the general symptoms vary according to the intensity of the inflammation, and the constitution of the patient; they are, however, essentially, those of fever, with disorder of the digestive organs; there being, in addition to those already stated, a pink lateritious sediment in the urine, which is sometimes also coloured with bile, whilst the stools show either a deficiency of bile, in being drab-coloured and clay-like, or otherwise they are green or blackish, from a vitiated state of that secretion. The tongue is furred or loaded, and the papillæ commonly erect. The pulse is variable, generally frequent and hard, especially in a first attack, and when the disease is fully developed in the extremity.

The duration of a first attack of gout varies from two to ten or twelve days, the œdema generally continuing after the subsidence of the inflammation, and there is desquamation of the cuticle with much itching. The disease sometimes reappears in another extremity — generally the other foot — and runs the same course, often with greater severity. After the subsidence of the attack, the patient usually feels in much better health than he probably has done for months, or it may be years, before; but notwithstanding this apparent benefit, the disease is almost sure to return, though the interval may vary according to the constitutional liability of the patient, and the pains which he may take to avoid those circumstances most likely to induce it. Thus, with ordinary care, after a first attack, three or four years of immunity may be hoped for; but the intervals become shorter and shorter, and what is worse, the attacks longer and longer, so that sometimes the gout becomes not only an annual visitant, but one whose absence is only of a few months' duration.

After each of the few first attacks, the swelling entirely leaves the joints, which recover their former mobility, but when the disease has recurred several times, the joints become permanently swollen, weak, and in some instances entirely lose their capability of moving; owing, too, to the vitiation of the secretion of the synovial fluid, there is a grating sensation produced upon bending the joints. Another effect is the deposition of what are familiarly known as chalk-stones (from their close resemblance to that substance) around the joints, filling up the areolar tissue, and lying for the most part immediately under the skin, one effect of which is entirely to destroy mobility. These consist of urate of soda, which is deposited in the first instance in a semifluid state, like mortar, and which subsequently hardens by the absorption of the fluid; the skin covering these concretions sometimes dies, and falls off, leaving them exposed, so that some persons in whom they have occurred have been known to be able to write with their knuckles as with chalk.

There is, as we have said before, a chronic form of the disease, in which the inflammation assumes a more lingering and chronic character, the pains are irregular and wandering, the redness less vivid, and the swelling of the part more permanent: there is at the same time considerable constitutional disturbance, disorder of the digestive organs, languid circulation, and that irritability of the nervous system which belongs rather to debility than to active inflammation.

This chronic gout is, in most instances, a consequence of one or more acute attacks, though sometimes it is itself the primary affection, and seems to be the effect of the presence of the gouty diathesis in the system, with want of power sufficient for sthenic action. In the latter form it appears to belong more especially to those who have inherited the tendency, but whose habits of life have not been such as to call it into activity; and accordingly it has been observed to be more common among women than among men. It is remarkable, too, that in this form of gout the ball of the great toe is not so commonly affected, but the disease is more apt to attack the wrist or ankle, so that in the slightest cases there is much difficulty in walking. The pains often follow the course of the nerves, and it is by no means improbable that this form has much more of a *nervine* character than has the acute.

We have already alluded to the possibility of the existence of the gouty diathesis, without its manifesting itself by any active inflammation—to the fact, in short, that a person may be *gouty* without *having the gout*. It is probably this circumstance that gives rise to the most dangerous phase of the disease, namely, its locating itself in some vital organ, constituting the *irregular gout*, otherwise described as misplaced, retrocedent, metastatic, or masked gout. Thus a person may have had some of the premonitory symptoms of an attack of gout, though in some instances hardly sufficient to attract much attention or divert him from his ordinary pursuits, when he is suddenly seized with vertigo, or it may be some more urgent symptom of cerebral disturbance, as loss of consciousness or hemiplegia; — or the heart may become the object of attack, and syncope, palpitation, or irregular intermittent pulse may be the consequence;—but perhaps there is no organ so likely to be assailed as the stomach and the parts immediately connected with it, when there is heartburn, sickness, flatulence, acrid eructations, and gastrodynia—sometimes, however, the symptoms are much more severe—the patient is attacked by cramp-like pains in the epigastrium, shooting thence into the upper extremities, or he may be seized with a cold death-like sensation at the pit of the stomach, as if a sheet of ice were laid there, the pulse becoming rapidly very feeble, and death from syncope being apparently imminent. Sometimes, again, the liver or the kidneys may be affected: in the former case, there is pain in the region of the liver, the secretion of which becomes either suppressed or of a morbid character; in the latter, there is violent pain in the region of one or both kidneys, the urine being in some instances suppressed, in others highly albuminous; in others, again, loaded with uric acid or urates. What is remarkable is, that these symptoms, sometimes when most urgent or alarming, will suddenly subside upon the appearance of gout in one of the extremities. In other cases, however, this process is reversed, the gouty inflammation suddenly subsiding in the extremity, and being followed, after an uncertain interval, by some very grave symptoms of disease in a vital organ. It is this which has received the name of retrocedent gout.

Concerning the pathology of gout, there has been much diversity of opinion. The earlier writers among modern physicians, as well as the ancients, considered it as the effect of a "peccant humour," which was endeavouring to throw itself off from the surface and extremities. Cullen, again, believed the seat of the disease to be in the nervous system, though he failed in his endeavour to prove it to be so: later authors have however recurred to the doctrine of the ancients, and are pretty well agreed that the cause of the more obvious symptoms is to be found in the presence in the blood of a morbid poison, which is of a cumulative character. This *materies morbi* is most likely a product of the secondary assimilative process, nearly allied to uric acid, if not identical with it: the uric acid in the chalk-stones, and the frequent relief of gout by the excretion of a large quantity of uric acid gravel by the urine appear to render this supposition highly probable, as does also the fact that luxurious living, with the use of a large proportion of animal food, is conducive alike to the uric acid and the gouty diatheses. What, however, is still more conclusive is that an excess of uric acid has been demonstrated in the blood by Dr. Garrod.

The circumstance of this *materies morbi* locating itself generally in particular parts or organs, though sometimes assailing others with equal violence, may be not unsatisfactorily explained by the suggestion of Dr. W. Budd, in the paper before alluded to (p. 59), viz., that these poisons have an elective affinity for certain tissues or organs or parts of the body, and that when a morbid poison has been generated in the system, it will primarily affect that particular part for which it has this affinity, and that it is generally not until this particular part has been saturated that the poison attacks that which stands next in order in the degree of affinity. It may, however, be repelled from the first part by some circumstance which prevents its active development; and conversely, when it has attacked some deep-seated part, it may be transferred to a part to which it has ordinarily a greater affinity, by the removal either of the condition which prevented its development in the latter situation, or of the irritation which attracted it to the former. The conditions upon which this peculiar elective affinity of the poison of gout, as well as other morbid poisons depends, are not in any way apparent; but it is obvious, from every-day experience, that it may be disturbed by disease, febrile excitement, and other causes of change in the vital actions, it being well known that gout will often attack a joint in which there has previously existed an inflammation, as from a sprain or otherwise, and even the cicatrix of an old wound.

It has been truly observed, in reference to these views, that they assume a modified humoral pathology as essential to the elucidation of otherwise inexplicable phenomena;* but it must not be forgotten that nervous influence may also control this affinity, and that there can be no doubt that in many cases it does so. Neither is it intended to imply that the real *materies morbi* is lithic acid, any more than in pyæmia it is pus, as in the latter case it is probable that the poison is a modified or imperfectly-elaborated pus; so in the case of gout it is not unlikely that the elements of uric acid being present in abundance, and the acid actually formed in excess, a slightly modified or imperfect acid is readily formed, and which acts as a poison. Thus Dr. Garrod found that the serum from a blister on the skin will give evidence of uric acid, provided the blister be not applied over a part which is the seat of gouty inflammation.

Notwithstanding the obscurity which attaches to the pathology of gout, it has been fully ascertained that it observes certain laws, viz., that it is hereditary; that the tendency in any individual is promoted by luxurious living and sedentary habits; that it more commonly attacks the male than the female sex; that it rarely makes its appearance in a subject under the age of five-and-thirty.

The only diseases with which acute gout is liable to be confounded are acute rheumatism and common inflammation affecting the joints. From the former it may be distinguished by its rarely affecting more than one joint:—by the age of the patient, which is in most cases far beyond that in which rheumatism is most frequent; indeed, we might even say that in this respect where rheumatism ends gout begins. In gout there is more evidence of disorder of the digestive functions; in rheumatism, of acute inflammatory fever. Common inflammation of a joint, again, may be distinguished from gout by the absence of intermission, the difference in the constitutional disorder, the character of the pain, and the state of the urine. Chronic gout, again, may be distinguished from chronic rheumatism by most of the circumstances just noticed—by the greater œdema, whereas the swelling in chronic rheumatism is in the bursæ and synovial capsules,—and by the tendency to form "chalk-stones."

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* 'Brit. and For. Medical Review,' vol. xv. p. 150.

The prognosis of gout, as must appear from what has been said, should at all times be guarded. Whilst the gout remains in the extremities, there is no risk to the life of the patient; but it is upon its liability to leave the extremities that the danger depends; and, notwithstanding that many persons find their health much better after an attack of gout than before it, and some even long for it as a means of clearing the system of other disorders, yet experience proves that a liability to gout is a source of danger, and all the assurance companies consider the life of a person who has been the subject of gout, so far endangered by it as to entitle them to demand an increased premium.

The treatment of gout divides itself into that which is applicable to the paroxysm, and the preventive or prophylactic, designed to correct the gouty diathesis.

By the earlier physicians, and until lately, the cure of gout was left, like that of rheumatism, to flannel, time, and patience; but there is in the minds of the greater number of practitioners a feeling that something should be attempted, and that our extended knowledge of the nature of the disease should be productive of some more efficient practice. If the views which were suggested as arising from the chemical agency of lemon-juice in the cure of rheumatism had been strictly correct, that substance ought to be still more efficacious in the treatment of gout; but this remedy has apparently little or no power over the latter disease. Of all medicines colchicum is undoubtedly that which approaches most nearly to a specific for gout, though its use is not without danger, and requires the greatest caution in the administration. Colchicum has, it is true, a decided influence on a paroxysm of gout; the pain which had before been intense sometimes ceasing almost entirely after the use of the drug has been continued for two or three days; and it has been ascertained that this ingredient enters largely into most of the popular nostrums for gout; but it is probable that its influence is greater in counteracting the local effects of the poison than in preventing its formation or in eliminating it from the system; and therefore, if precautions be not taken to insure one of the two latter results, the disease which has subsided in the extremity is very apt to reappear in its most dangerous form in some important viscus. Colchicum, then, unless it act as an eliminant, either by the skin, the bowels, or the kidneys, is a palliative rather than a remedy for gout.

It should always be borne in mind, in the treatment of gout, that not only may the inflammation be driven to an internal part by checking it in the extremity, without at the same time eliminating the disease from the system; but also that it may be drawn or attracted to it by exciting irritation in that situation: and therefore, since colchicum acts, as Dr. Watson justly observes, as an anodyne in the gouty paroxysms, it may have the former effect; and as it is also apt to be a powerful excitant to the alimentary canal or kidneys, it may in the latter way prove dangerous.

The best and perhaps the safest treatment of gout consists therefore in the combination of the colchicum with means which may promote elimination without powerfully affecting the excreting organs.

The patient should be confined to bed, and the affected extremity wrapped in flannel or in cotton wool, and a few grains of blue pill may be given at bed-time, with three or four of James's powders and the aperient draught (13)* administered the following morning; after this the saline recommended in rheumatism, but with about half the quantity of the salt, may be administered two or three times a day, with at first about ten minims of the vinum colchici, or the form (14)† may be used instead of it. If the bowels are torpid, the blue pill and cathartic draught may be repeated; or if the motions are deficient in bile without the bowels being confined, the blue pill alone may be used.

After the pain and inflammation have subsided, what Dr. Watson calls alterative doses of colchicum may be employed;

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* (13) ℞ Mannæ, ʒ iss.
Vin. Colchici, ♏ xx.
Infus. Sennæ co. ʒ x.
Pot. Tart. ʒ ij.
Tinct. Cardom. co. ʒ i. Misce.
Ft. Haust.

† (14) ℞ Potassæ Acetat. ℈ i.
——— Bicarb. gr. x.
Vin. Colchici, ♏ x.
Decoct. Hordei, ℥ iss. Misce.
Ft. Haust.

about five minims of the wine being given three times a day. (15) *

The treatment of the gouty diathesis, that is of a gouty patient between the paroxysms, must be chiefly dietetic. Moderate living, and regular moderate exercise, will in many cases, if steadily adhered to, procure a perfect immunity from future attacks ; and if a necessity for stimulating drinks have not been established by their long-continued use, it will be worth any *young* man's while to become a teetotaller : though it is otherwise with the old, and those who have been inured to what is miscalled good living, or whose constitutions have been impaired by this inveterate disease ; for if their powers be enfeebled by reducing their mode of living, the debility thus induced renders them only the more susceptible; though in all a single debauch may bring their enemy suddenly upon them. Gout in the stomach, whether it attack the organ by retrocession, or whether it arise there primarily, is always attended by imminent danger. It does not, indeed, appear that the affection is of an active inflammatory character, since it is most commonly relieved by stimulants, and threatens death by syncope ; it is probably in the form of an asthenic hyperæmia. When the symptoms of this affection present themselves, our first business should be to ascertain if any indigestible food has been taken. Yet it is possible, upon the principles already laid down, that the latter may excite the former. When there is reason to believe that such matters are present, an emetic should be administered ; and afterwards the magnesia draught (15), with about ten minims of laudanum ; if this fail, a glass of brandy will sometimes allay the pain completely.

* (15) ℞ Mag. Carb. gr. xij.
Tinct. Cardom. co. ʒ ss.
Vin. Colchici, ♏ v—x.
Aquæ puræ, ʒ x. Misce.
Ft. Haust.

X.

AUSCULTATION.

Before we commence the consideration of the diseases of either of the three great cavities of the body, as they are termed—namely the cranium, the thorax, and the abdomen—it may be well to call to mind that each of the viscera contained in any one of these cavities is differently circumstanced from those in either of the others, in regard to the degree in which they are accessible to our examination of their physical condition. The viscera enclosed within the cavity of the cranium, are screened by its bony walls from our manipulation, and, therefore, we are confined in our endeavours to ascertain the seat and nature of any disease which may be going on within them, to the use, first, of those general, or as they are termed, constitutional signs by which we judge of the existence of inflammatory or other disease, and secondly, of the disturbance or non-performance of the function (the *læsa partis functio*) of any particular part or organ; but we are unable to appreciate, and consequently to derive any assistance from, the physical changes which the disease may have induced.

The viscera of the abdomen, again, are contained in a cavity, the walls of which for at least two-thirds of their surface, yield readily to the pressure of the hand, and, consequently, allow us to detect changes which disease may have produced in the size or hardness of their contents. We are also enabled, from the same circumstance, to detect any tenderness which inflammation may have excited, and thus obtain further important information as to the nature, the seat, and the extent of the disease; and by the use of percussion to detect any variation in the solidity of the viscera, a matter of great importance in regard to the hollow alimentary canal.

The viscera of the chest, again, are differently circumstanced in the above respects from those of either of the other cavities.

They are, indeed, excepting where its cavity is separated, by the diaphragm, from the abdomen, and at the comparatively small space above, included between the two first ribs, the vertebræ, and the first bone of the sternum, enclosed within walls rendered rigid by bone or cartilage, and, therefore, withdrawn almost as completely as the brain from every attempt to determine any change in their physical condition by means of the hand: this is, perhaps, one reason why there was, till within the last thirty years, the greatest difficulty in determining not only the seat or character, but often the very existence of disease within the chest. Since, however, the happy thought which had before suggested itself to Avenbrügger (and there is some ground for suspecting even to Hippocrates), of applying another sense, that, namely, of hearing, to the investigation of disease, was realized and made practically available by Laennec, a complete revolution has taken place in the comparative accuracy of our diagnosis of diseases of the viscera of the chest, and those of the other regions of the body; so that we are now able to diagnose their nature and seat with an approach to certainty, which we have yet to attain in regard to diseases of the head or the abdomen.

For although the viscera of the chest are beyond the reach of the sense of touch, they are peculiarly accessible, so to speak, to that of hearing. The lungs which occupy by far the larger portion of the cavity of the chest, have, in their healthy state, a loose spongy texture, the cells being filled with air; the consequence of this is, that when a moderate blow or tap is given upon the ribs, a sound is elicited very different from that which would be heard if there were a solid body in their place: the healthy chest has, in fact, over a great part of its surface, a certain resonance upon percussion, the absence or noticeable diminution of which is inconsistent with health; for the lung may be rendered solid and impervious to air by disease; or it may be displaced and compressed by fluid, and thus the resonance of the chest, when percussed, is diminished or obliterated; or, on the other hand, the cells may be preternaturally distended with air, or by a rupture of the pleura, air may find its way between the lung and the ribs, and thus a preternatural, or morbid degree of, resonance may be imparted. We see thus upon what principles the sound elicited by percussing or striking the chest may be made to assist us. But this is not the only application of the sense of hearing to the investigation of the diseases of the chest, or even the most useful one; for the viscera of this region of the body, whilst they perform their healthy functions with admirable precision and regularity, accompany their action by certain well-known sounds, which, to the ear of the practised listener, tell a tale of health and order. A soft blowing sound may be heard as the air passes through the bronchi to distend the cells of the lungs, and the filling of these cells as the air reaches them, is attended by a whispering murmur. The ceaseless swinging action of the heart, too, has its music. The contraction of this mainspring of the circulation, together with the closure of the aurico-ventricular valves which attends it, causes a softish, though prolonged sound, whilst the closure of the sigmoid valves of the great arterial trunks which immediately follows the completion of the systole, and accompanies the diastole, has its shorter and sharper one.

Now it needs hardly a moment's consideration to perceive that if the bronchial tubes be narrowed or widened by disease, or if they be obstructed by the accumulation of an excessive secretion, or if the lungs lose their spongy texture, and their cells become obliterated, or if they be unduly distended, or lose their elastic contractility, or if caverns be formed in the substance of these organs, or if fluid or plastic effusion, or air, find its way between them and the walls of the chest, these sounds must be greatly altered or obliterated, or new and totally different ones must be produced. Again, as regards the heart, it is equally evident, that if its valves be imperfect, or if there be any great disproportion between its different cavities, or between any one of these and the orifice by which it discharges its blood, or if the texture of the pericardium be so changed that the organ cannot play smoothly in its serous capsule, its rhythm must be deranged, its sounds altered, and new and unnatural ones must be heard. We see, then, the reason of the practice of auscultation or examining by the ear the condition of the organs of the chest.

We now proceed to describe briefly how this examination is to be conducted, premising, however, that any description which may here be given is intended only to make what follows more clearly understood; that the repeated examination of the healthy chest is within the reach of all; and that if it be conducted upon a few simple and intelligible principles, it will quite supersede all lengthy and complicated descriptions.

Of the sounds which accompany the action of the heart and lungs in health, no description can give a very accurate idea; but they may be fixed in the memory by repeated observation; and this having been done, they will form a standard wherewith to compare the new and altered ones which present themselves in disease. As for the latter, it has been found expedient to represent them by certain words, supposed to be descriptive of the sound in question; and these words will be used in their generally received acceptation, so far as that can be ascertained, care being taken to avoid the needless encumbering of the subject with an obscure phraseology. We shall, however, forbear giving any description of these terms, or of the phenomena which they represent, until we come to treat of the diseases in which they occur; knowing that the best explanation of the morbid sounds is to be found in the diseased changes of structure or function which give rise to them: and believing that the rational study of disease of the chest has been rendered needlessly difficult, if not repulsive, by the attempts to make a separate art of the interpretation of the acoustic phenomena, which accompany disease, and to make the art obscure by encumbering it with semibarbarous technicalities.

Many authors have thought it expedient to map out the chest into different regions for the purpose of more accurately locating morbid changes or signs. As, however, the chest is provided with natural lines of demarcation, such artificial division appears to be unnecessary, and upon the whole rather an embarrassment than an aid to the learner, whilst the mind of the more practised auscultator will always associate any portion of the surface of the chest with the parts beneath it, too readily to require any such artificial boundaries.

Where the condition of the patient and other circumstances allow it, it is desirable that he should be seated in a chair, in a semi-erect or slightly-inclined position, and then (when the patient is a male and where there is no risk from exposure to cold,) after the clothes have been removed as low as the waist, to proceed to investigate the anterior part of the chest. In the female subject, the delicacy of the patient may always be consulted by throwing a shawl or some other covering over the shoulders, and this so as to leave bare only the small space which we wish to examine at one time. The first thing in doing this should be to observe carefully the movements of respiration, comparing by the eye the relative mobility of the different ribs, and making a more special comparison between that of the corresponding ribs on the opposite side. This is a point which cannot be too carefully insisted upon. This mobility should be still further tested by placing the hand on each side of the chest in different situations respectively corresponding to each other; thus calling in the sense of feeling to the aid of that of sight. The hand should also be laid upon the abdomen, and its movements observed, in order to ascertain whether the action of the diaphragm in respiration is excessive or defective. It is not amiss to test the expansion of the chest upon inspiration by a measure drawn round the breast: the expansion of the chest thus measured should in the adult male be an inch and a half.

The next step may be to examine the chest by percussion. Now percussion is of two kinds, immediate, that is, by striking directly upon the chest, without the intervention of any other substance between the integuments of the patient and the fingers of the operator—and mediate, that is, by placing some substance, as a disc of India-rubber or ivory, upon the chest to receive the stroke of the operator: this substance is termed a plessimeter. It is true, indeed, that mediate percussion is upon the whole less disagreeable to the patient, and more satisfactory to the observer; but the best plessimeter will be found to be the first, or first and second, fingers of the left hand; and the best percussor the first and second or first three fingers of the right hand curved and brought close together, so that not one of their extremities shall project beyond the rest. The fingers of the left hand should be laid flat upon the chest, and always at the same inclination to the ribs; the best method will generally be to place them across the ribs at an angle of about 45°. The tap or stroke given to them should be a moderately sharp and brisk one, the fingers with which the stroke is given not being allowed to remain in contact with those which receive it sufficiently long to deaden the sound, which they will of course do, if allowed to rest there, by checking the vibrations upon which its clearness depends. These precautions being observed, the percussion may be practised, commencing with the space immediately under the clavicle on either side, and then proceeding in the same manner with the corresponding space on the other side, so as to institute a comparison between the resonance of the two. In addition, however, to these precautions, it should be remembered that independently of disease, there are several circumstances which tend to increase or diminish the resonances of the chest, and that in health the resonance varies in different parts of the same chest.

Thus the resonance of the chest is greater in lean than in fat persons. In the old, again, the increased rigidity of the cartilages, from the greater quantity of ossific matter contained in them, has the effect of diminishing the elasticity of the skeleton, and, to a certain extent, the resonance also; though this effect is often more than counterbalanced by the less quantity of fat, and even of muscle, on the walls of the chest, and by the enlargement of the air-cells, whereby the resonance is increased. Again, the resonance of different parts of the chest varies according to the quantity of muscle overlying each. Thus the regions of the scapulæ and the pectoral muscles are duller on percussion, and the axillæ and margin of the middle portion of the sternum on the right side are the most resonant. There are, however, differences as regards the contents of the different parts of the thorax which materially affect the resonance, and which it is still more important to remember: thus the chest contains, besides the lungs, the heart and large vessels, the former of which is in contact with the interior surface of the chest through a space of nearly an inch in diameter. Over the corresponding portion of the chest, and some way beyond it, owing to there being only a thin layer of lung interposed between the heart and ribs, that is to say, over the cartilages of the fifth and sixth rib, in the space between them, and from the middle bone of the sternum for about an inch and a half leftwards, the sound is dull. The resonance is also defective over the false ribs on the right side, owing to the proximity of the liver: and in children, owing to the liver being proportionately larger, and sometimes in females, owing to the pernicious habit of tight lacing, this dulness extends as high as the sixth or even the fifth rib. On the left side, again, in the same situation, we have often a great variation in the resonance, and that taking place in a short time in the same individual; thus the stomach may be distended by gas, and rise higher than usual, the effect of which is to give rise to a peculiar ringing sound, or, on the other hand, it may be filled with liquid, and thus diminish the resonance in the same situation; as a general rule, however, the lower part of the chest is duller on the right than on the left side.

The exploration by means of the sounds elicited by percussion is, in fact, a species of auscultation or listening; but there is another mode of listening of perhaps even greater importance than the former, which is termed, *par excellence*, auscultation, and that is, by listening to the action of the various viscera of the chest.

It needs hardly a moment's reflection to perceive that if a large bronchial tube be closed, the respiratory murmur will cease in the corresponding portion of the lung; and that the same thing must happen if the lung, or a portion of it, be rendered irrespirable by the filling of its cells by morbid deposits, or by its being compressed, by air, by fluid, or by solid tumours. But without being silenced the sounds of respiration are apt to be very much altered by disease; they may be rendered louder than natural owing to undue activity of a portion of the lung, in which case the respiration is said to be *puerile*, from its resemblance to the breathing of children. Again, they may be too faint, as is the case when the cells are over-dilated, or when there is partial obstruction of a large bronchus. Again, the respiratory murmur may be altered in character rather than in intensity, as when the breathing becomes hissing, or, as it is termed, *sibilant*, by narrowing of the extreme ramifications of the bronchia from swelling of their lining membrane; or the soft whispering murmur may be converted, by change in the walls of the cells, into a fine crackling sound termed a *dry crepitation.* Again, in the case of the heart, if there be any great change in the size of its cavities or the thickness of their walls, the sounds which accompany their contraction and the discharge of their contents will be likewise changed; and if the valves be much altered in structure there will be some modification of the sounds which attend their closure.

The above, however, is not all; for disease may occasion new sounds as well as the alteration of the natural ones; it, in fact, has its own proper sounds as well as health. Thus the secretion which lines the bronchial tubes is not, in health, of sufficient quantity to cause any sound by its being disturbed by the passage of air through them; but when this secretion becomes excessive in disease, its agitation, both in inspiration and expiration, gives rise to a sound resembling that which would be produced by blowing through a tube partly filled with fluid, such as water thickened with mucilage, which sound will, of course, be modified according to the size of the tube, and the quantity, and thickness or viscidity, of the fluid. In this manner are produced the different sounds termed rattles, to be hereafter specially described.

Again, there are sounds termed ronchi, which may be sibilant or hissing—sonorous—cooing—the result of contraction or dilatation of the tubes; as well as a modification of these, termed cavernous respiration, from the air passing in and out of a large cavern or hollow, however formed. These caverns, when partially filled with pus or mucus, give rise to a species of rattle termed gurgling. The passage of air through the bronchial tubes is not to be heard in health, except just below the sterno-clavicular articulation; but when the lung is condensed by disease, or pressed upon by fluid, it becomes audible, and we hear what is termed bronchial respiration. Mucous crepitation, again, is a modification by fluid in the smaller tubes of the affected portion of lung, of the crackling or crepitation already described. These sounds, and others which are varieties or exaggerations of them, will be more clearly understood hereafter, when we come to treat of the diseases in which they are produced, so that an analysis of them in this place would be premature. We may, however, here remark that we have

(1.) Sounds of respiration, modified by disease of the part where it is heard, as coarse or harsh respiration—or by that of other parts, as puerile respiration.

(2.) Sounds which may exist in health, but only become audible on the surface of the chest by change in the conducting power of the surrounding tissues, as bronchial or tubular breathing, and perhaps also the *ex*piratory murmur.

(3.) Sounds produced by changes in the walls of the tubes, as ronchi.

(4.) Sounds produced by changes in the contents of the tubes, as rattles.

(5.) Sounds produced by the formation of new hollows accessible to the air, as cavernous sounds.

(6.) Sounds produced by changes in the structure of the cells, as dry crepitation and wheezing.

(7.) Lastly, we have the sound produced by the motion of two surfaces of the pleura upon each where the smoothness of the membrane has been impaired by disease.

Again, many of the structural changes, produced by disease, give rise to certain alterations in the sounds heard at the surface of the chest, in speaking or coughing, which alterations are valuable signs of these particular changes. Now the morbid phenomena observed on the surface of the chest when the patient speaks are similar to some which may be observed in health, but only in particular situations. Thus, when the stethoscope is applied over the larynx of a person whilst he is speaking, the sound appears to proceed along the instrument to the ear of the listener, much as if the mouth of the speaker were applied to that of the instrument. This is termed laryngophony. But when a similar phenomenon is observed on the surface of the chest (while it is not in health) it is called pectoriloquy. Again, when the ear or the stethoscope is placed between the scapulæ, in many persons the voice seems not so much to proceed from the part upon which it rests as to traverse it; it is, in fact, heard at that spot, but seems to be crossing, as if some one were speaking through a quill laid across the bell of the instrument or the ear of the listener. This is bronchophony, which is also observed as a morbid phenomenon on the surface of the chest.

These sounds are audible on the surface of the chest, and become morbid phenomena under the following conditions. Pectoriloquy occurs when there is a large hollow having each diameter as large at least as that of the trachea, surrounded by a substance more homogeneous than healthy inflated lung, and of greater density.—Bronchophony, again, takes place when there is interposed between the surface, where the ear or the stethoscope is applied, and a bronchial tube, a substance of greater density than healthy lung, such as consolidated lung, or lung compressed by fluid, with the fluid itself.

It would be out of place here to enter minutely into the examination of the causes of these phenomena upon acoustic principles; but as some confusion appears to have arisen from the views put forward some years ago by Professor Sköda, it may be well to submit the following brief explanation :—In the healthy condition of the lungs and air-passages, the vibrations of the vocal chords upon which the voice depends, are propagated downwards along the trachea and large bronchi—these vibrations being communicated both to the walls of the trachea and large bronchi, and to the column of air contained within them;* but the bronchi become divided into innumerable branches and twigs, which again are surrounded by the spongy lung, so that not only are the vocal vibrations broken and obstructed by being thus diverted into innumerable directions, or in other words their power of consonating destroyed, butthey are also muffled, and, as it were, smothered, by the heterogeneous substance which surrounds them, which also prevents any sounds which may be excited in them being propagated to the surface of the chest. When, however, instead of spongy lung and the minute ramifications of the bronchia, a larger tube is surrounded by a more dense or homogeneous structure, its power of transmitting the sonorous vibrations will be increased, and if the consolidation be extensive those vibrations which are excited in the walls of the tube, as well as the air contained in it, will be propagated directly to the surface. Thus lung consolidated by inflammation, affords the most favourable condition for this phenomenon, provided the consolidation extends to the surface of the organ. Effused fluid, again, will propagate these sounds better than the non-homogeneous lung, but by no means so powerfully as air and solids.

The opinion of Dr. Sköda that bronchophony is wholly produced by a *consonance* between the air in the tubes and the voice, is opposed to the explanation which has just been given, and appears to be based upon some confusion between consonance and propagation of sound, though it is conceded that the power of consonating must be much increased in the tubes by their being surrounded and supported by condensed lung.

The diagnostic import of the various sounds observed in the auscultation of the voice, as well as their various modifications, will be best considered in connection with the diseases in which they occur.

The signs observed in coughing agree both as to the principles upon which they may be explained, and their diagnostic significance, so closely with those of the voice as scarcely to require a separate notice in this place.

Another mode in which sound is available for the detection of disease is the applying the ear to the chest of the patient and giving him a sudden jerk; this is termed *succussion*, and under certain diseased conditions a splashing may be heard like that of a small cask partly filled with water. This sound, in fact, depends upon the presence of air and fluid in the same cavity.

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* According to the views of Dr. Sköda, this sound is produced by the occurrence of what is termed *consonance*; but it must be obvious to those acquainted with the subject, that, for the production of this latter phenomenon, there is required a relation between the note or tone of the tubes and that produced at the vocal chords, which would not, according to all ordinary probability, be so uniformly present as it must be, to produce the common occurrence of bronchophony.

Of the sounds of the heart, both in health and disease, it will be most convenient to speak when we come to treat of the affections of that organ.

We may now say a few words about the practice of auscultation. Auscultation, like percussion, is of two kinds, immediate and mediate. The former consists in the direct application of the ear of the listener to the chest of the patient; the latter in the use of an instrument termed a stethoscope, to convey the sound from the one to the other. Each of these methods has its advantages, for there can be no doubt that where the ear can be applied closely to the surface of the chest, it must receive the sounds which are present there more accurately than if they were exposed to being modified by transmission through some other substance. But the ear cannot well be applied to the surface of the chest in all situations and under all circumstances, and therefore it often becomes necessary to have recourse to the stethoscope. This instrument has also the further advantage, that although by its assistance we can hardly hear so plainly as with the naked ear, we can locate the sounds more accurately. It is, however, quite indispensable that the operator should be well practised in both methods.

There has been a difference of opinion as to the mode in which the sound is transmitted from the chest to the ear, some believing that it is conveyed by the walls of the instrument, where a hollow one is used, others that it is propagated by the column of confined air within it. Now, if the former opinion be correct—and the fact that the sonorous vibrations with which we have to do are those existing on the surface of the chest and consequently taking place on a solid would lead us to believe that it is so—a solid instrument should be preferred to a hollow one. Accordingly, solid stethoscopes have been constructed, and several practitioners have believed that they heard better with them than with the ordinary hollow ones. Practically, however, there is little if any real difference, and the rules which it is most important to observe in the choice of a stethoscope are, that the ear-piece should upon trial be found well-suited to the ear of him who is to use it; that the base of the bell should not be too large, that is to say, not more than from an inch to an inch and a quarter in diameter, as if it be larger than this it cannot be so accurately applied. It is also desirable that the stethoscope should be of the same material throughout, or at least that there should be a continuity of the fibres of the wood from the base to the centre of the ear-piece.

XI.

CYNANCHE, LARYNGITIS, CROUP, DIPHTHERIA.

In treating of the diseases of the different regions of the body, it is expedient to begin with those of the viscera of the trunk, since these may be considered as the rudimentary, being more often the cause of disease in other parts than the consequence of them; and the reason of this is obvious, for in one or other of the great cavities of the trunk reside the organs which form, elaborate, move, and purify, the blood. We therefore at once proceed to inflammation of the lungs and air-passages.

Of the inflammation of the organs of respiration, that which naturally presents itself first to our notice is cynanche tonsillaris, or inflammation of the tonsils.

This disease is one about the diagnosis of which there is no great difficulty, as the symptoms are apparent, and the part immediately affected is accessible to inspection. It has been characterized by Cullen as affecting the mucous membrane of the fauces, and more especially of the tonsils in most cases, with swelling and redness; the accompanying fever being of an active or inflammatory character. The disease often commences with strong pains in the limbs, and general lassitude, followed by flushings of heat and thirst, with increased frequency and sharpness of the pulse, and a furred and somewhat coated tongue and severe headache—with the symptoms, in short, of the commencement of inflammatory fever; though it not uncommonly happens, on the other hand, that the local signs are the first to manifest themselves. These consist, in the first instance, in a feeling of soreness and constriction in the throat, with painful deglutition, and a difficulty in speaking, attended with a peculiar character of the voice, which may be readily recognized, though not very easily described; but may, perhaps, be compared to an attempt at speaking whilst a morsel of food is in the fauces. The respiration is at first but little affected. Upon looking into the mouth, we see the membrane, covering the fauces, the velum, the uvula, and the tonsils very red, and the latter much swollen. Thus far we have the redness and tension proceeding from the congestive stage of inflammation, with diminution of the secretion of the part, but, as the disease proceeds, one of its consequences, the increase of the secretion, takes place in the form of a copious and transparent, rather viscid frothy mucus, which, as the patient is unable to swallow without pain, produces continual annoyance from his efforts to expel it.

Small opaque whitish spots now begin to show themselves; these might be by careless observers mistaken for incipient sloughs or ulcers; but are, in reality, effusions chiefly from the follicles—fibrinous shreds or globules, giving the appearance of films of lymph to the exuded mucus. There is now great difficulty in opening the mouth, it being often impossible to separate the jaws far enough to admit one finger between the teeth, or sufficiently to allow the passage of the tongue, which independently of this, is protruded with much pain and difficulty, on account of the inflammation about the pharynx. When seen, the tongue is perceived to be covered with a thick creamy mucus, and streaming with the increased secretion from the fauces, and the pulse is quick and sharp, but rarely hard.

The inflammation may now be said to be at its height, and may commonly be expected, unless any great extension to the neighbouring parts takes place, either speedily to subside, or to proceed to suppuration. Sometimes the inflammation extends along the mucous lining of the Eustachian tube, producing pain in the ear: this pain, indeed, is said to indicate approaching suppuration, and certainly it often precedes it. The disease may be, indeed, attended with still more urgent symptoms, apparently more deeply seated, or involving to a greater extent the submucous areolar tissue; but these more severe cases are generally of a specific character, as diffuse erysipelatous inflammation, or that of scarlatina, constituting the cynanche maligna, to be described hereafter.

If resolution of the inflammation do not take place, suppuration commonly ensues, in which case the fever is protracted for a few days longer, or even a fresh accession takes place, ushered in by rigors. The tonsils become more swollen and distended with pus, which may often be seen through the attenuated membrane. This abscess at length bursts, discharges a small quantity of highly offensive puriform matter, and the patient is instantly relieved.

This disease, though very painful, and often attended with much distress to the patient, is, in its simple form, rarely a dangerous one: it for the most part yields in the commencement to prompt treatment, by which suppuration is arrested; and where it does take place, and where great obstruction to the breathing follows, this may almost always be instantaneously relieved by opening the abscess. Perhaps the only cases in which cynanche proves fatal, are those of a specific character already mentioned, and that spoken of as extending down into the areolar tissue.

It has just been stated that in most instances the accompanying fever is of an active character. Many cases, however, have presented themselves (perhaps more since the appearance in this country of diphtheria) in which the fever has been from the commencement of a low type, and in which there has been throughout considerable danger from the tendency to asthenia.

This disease may, moreover, assume a tedious and protracted form (1) in persons of a sluggish circulation, in whom the inflamed part becomes of a purplish colour, with a loose condition of the velum, and perhaps elongated uvula, constituting what is commonly known as relaxed sore throat. (2.) In those of a scrofulous habit, especially children, the tonsils are apt to remain swollen and indurated, and sometimes, after repeated causes of irritation, pass into a state of chronic ulceration. (3.) In those whose constitutions have been tainted by syphilis or mercury.

In the cases of simple cynanche, with active fever, the object at the commencement of the inflammation should be to cut it short, or, in other words—to induce its resolution. For this purpose decided and vigorous, though not violent, antiphlogistic measures, should be pursued. These should consist of evacuants, derivatives, sedatives, and the antiphlogistic regimen.

It is not often that general bleeding is required: in robust subjects, however, when the inflammatory symptoms threaten to be very severe, it may be resorted to, and must then be carried to such an extent as to produce a decided impression upon the system: such cases are, however, rare, but when they do occur, general bleeding is to be preferred to local. Another evacuant which is often of signal service in the commencement of cynanche, is an emetic; indeed, it often happens that a full emetic, followed by pretty free purging, arrests the disease, and the patient becomes convalescent in the course of twenty-four hours. (16) *

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* (16) ℞ Antim. Pot. tart. gr. j.
Pulv. Ipecac. ℈ j. Misce.
Ft. Pulv. emet. stat. sumend.
℞ Hydr. Chlor. gr. ij.
Ext. Coloc. co. gr. viij. Misce.
Fnt. Pil ij. post horas tres sumend.,

Or the emetic and purgative may be given in combination, as in the following mixture:—

When the inflammation is too far advanced to render it probable that it will be cut short by these means, but is still in its active stage, as shown by the redness of the tonsils, and some degree of sharpness in the pulse; diaphoretic and even nauseating medicines may be given, and the patient kept upon a light diet, care being also taken to secure a free action of the bowels. (17)*

Where the bowels are irritable, which, however, is not generally the case, the wine of ipecacuanha may be substituted for that of the antimony; or the same may be done when the pulse is so compressible as to justify the apprehension that the latter medicine may be too depressing; still, as a general rule, cynanche is a disease to which in its earlier stages antimony is especially applicable. At the commencement of cynanche astringent gargles aggravate rather than relieve the suffering of the patient, but the gargling with warm barley water is often productive of much comfort, and probably relieves the tension of the vessels by favouring the secretion from the part. The inhalation of the steam of warm water is, perhaps, still better, as it is unattended with the action of the muscles of deglutition requisite for gargling.

When the inflammation has been neglected at its commencement, or when, as it sometimes will, it proceeds in defiance of the most prompt measures, a change of treatment will generally be advisable: all depressing remedies should be laid aside, and moderate support given to the patient; and if the pulse have become feeble, and there is much prostration (owing partly to the abstinence from food, which the difficulty in swallowing often compels), stimulants, as wine, will relieve the depression, and forward the progress of the abscess. If the abscess do not speedily empty itself, or the accumulation of matter opposes great impediment to deglutition and respiration,

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℞ Mag Sulphat. ʒ vj.
Antim. Pot. tart. gr. iij.
Aq. puræ, ℥ iij. Misce.
Sumat Cochl. j. ampl. omni semhori ad plenam vomitionem.

The common effect of this mixture will be, after a few doses, to excite full vomiting, which will generally be quickly followed by a free action of the bowels.

* (17) ℞ Vin. Antim. Pot. tart. ʒ ii.
Sp. Æth. nit. ʒ i.
Tinct. Hyoscyami, ʒ i.
Mist. Acac.
Syrupi Aurant. āā ℥ ss.
Liq. Ammon. acet. ℥ jss.
Mist. Camphoræ, q. s.
Ft. Mist. ℥ vj. de quâ sumat part. 4tam quart. quāq. hor.

℞ Pulv. Ipecac. co. gr. iv.
Ext. Coloc. co. gr. vj. Misce.
Fnt. Pil. ij. h. s. sumend.

it will become necessary to give vent to the pus, which generally affords instant relief to the patient. After this has been done, tonics, and even stimulants, may be employed, in the form of bark or quina, animal diet, and a moderate allowance of wine.

When the inflammation has not proceeded to suppuration, but has yielded at once to the remedies employed, there frequently remains a considerable degree of depression, which will be best relieved by moderate doses of quina, care being taken to secure a regular action of the bowels; for this purpose the disulphate of quina, with a little sulphate of magnesia, in a bitter infusion acidulated with sulphuric acid, will be the most eligible; (18)[*] at the same time an astringent gargle (19)[†] may be used with benefit, as the tonsils and uvula often continue enlarged and of a purplish colour, constituting the relaxed sore throat already alluded to. This latter affection, however, often comes on without being preceded by a decided attack of acute cynanche; but in such cases the treatment should be tonic and even stimulant, as in the chronic form which has followed the acute disease, though the gargle may be rendered more stimulating by the addition of about half a drachm of tincture of capsicum; or one of a solution of nitrate of silver may be used instead. A pure air and moderate exercise, with nutritious diet, will do much to aid the cure; but not less important than all, is the negative precaution of avoiding those circumstances which are liable to excite a fresh attack, to which the patient will commonly continue for some time liable; amongst the most active of these may be reckoned exposure to an atmosphere which is at once cold and damp; the going from a warm and crowded place, whether church, theatre, ball-room, public meeting, or private party, into a cold air; and the perhaps no less dangerous transition from a cold, frosty air, to the front of a blazing fire.

[*] (18) ℞ Quinæ Disulph. gr. vj.
Mag. Sulphat. ʒ iij.
Acid Sulphat. dil. ʒ ss.
Syrup. Aurant. ℥ ss.
Infus. Aurant. co. ℥ iijss. Misce.
Sumat. part. 4tam ter die.

[†] (19) ℞ Aluminis, ʒ ss.
Mellis Rosæ, ℥ ss.
Tinct. Myrrhæ, ʒ ss.
Decoct. Cinchon. ℥ vii. Misce.
Ft. Garg.

LARYNGITIS.

Nearly allied to cynanche tonsillaris, but of a far more formidable character, is the cynanche laryngea, or laryngitis; indeed, it is to its tendency to run into this disease, that the first-named malady owes its principal, if not its only, danger. Laryngitis is, as its name imports, an inflammation of the larynx, especially of the cartilages, and affords an instance of inflammation exciting danger not so much from the constitutional disturbance, or the exhaustion consequent upon it, as by its arresting the function of a part essential to life.

This formidable disease is mostly sudden in its invasion and rapid in its progress. The first complaint made by the patient is of a sore throat, but this is generally attended with an unusual degree of anxiety; and upon looking into the throat we may perceive an increased redness of the fauces, but not an inflammation sufficient to account for the general distress. The next symptom is difficulty of deglutition, and when this supervenes upon those mentioned above it ought always to excite alarm; at the same time the voice becomes husky or croaking, or perhaps more often it degenerates into a whisper: there is also great dyspnœa, the respiration becoming almost of a crowing character, and there is a harsh, discordant, half-metallic-sounding cough, but for neither of these symptoms can any adequate cause be discovered upon exploration of the chest by auscultation. The patient also complains of a most painful sense of constriction, which he refers to the situation of the pomum Adami, and of tenderness about the situation of the point of the os hyoides. About this period of the disease there takes place an abundant glairy secretion of rather stringy mucus; and if its progress be not now arrested it runs speedily on to a fatal termination. The distress of the patient becomes greater and greater, and there is increased difficulty in speaking and dread of making the attempt either to speak or to swallow. The efforts in respiration are truly distressing, especially during inspiration, each attempt at which is attended by a hissing and sometimes almost crowing sound: the only words uttered are expressive of a desire for air and a sense of suffocation, the shoulders and clavicles are drawn up, the neck straightened, the head being thrown somewhat backwards, and the accessory muscles of respiration thrown into violent action, by which the cartilages of the larynx are drawn down towards the sternum; the dyspnœa is liable to paroxysms of intense aggravation, during which the patient is nearly suffocated; after a time the countenance becomes dusky, the skin moist and clammy, the pulse very feeble at the wrist, though the impulse of the heart remains considerable, and the patient dies of apnœa.

The pathology of this disease is exceedingly simple, and the symptoms during life are pretty clearly explained by the morbid changes displayed by inspection after death. The seat of the inflammation is, as has been already stated, the mucous covering of the larynx and its cartilages, including the rima-glottidis, the epiglottis, and sometimes the sacculi laryngis. The first effect of inflammation of the mucous membrane is engorgement of the minute vessels by which it is abundantly supplied, attended with increased nervous sensibility: the consequences of this are the pain, swelling, heat, and redness of the part affected, and there is also in this stage of the inflammation diminution of the secretions of the membrane. Hence the redness observed in the fauces at the commencement of the disease; the pain and tenderness, with difficult deglutition—the "sore throat,"—the hoarseness of the voice, and the pain on speaking. The next stage in the process of mucous inflammation is that in which the inflammatory products are effused, and accordingly there ensues an effusion of serum or liquor sanguinis into the areolar tissue underneath the mucous membrane, which effusion sometimes becomes of a puriform character; at the same time there is often an increase in the secretion of the surface. Now the danger of this effusion in the part indicated must be apparent, and it will satisfactorily account for the distressing symptoms which have been described: it, of course, greatly adds to the swelling, and not only is the larynx much encroached upon and its canal narrowed, but the little crevice in the glottis by which the air passes into it is rendered less and less, and sometimes entirely closed by the continual swelling of the membrane and its subjacent areolar tissue.

The morbid change which essentially belongs to this disease, and which is constantly found upon inspection after death, is infiltration of the areolar tissue in the part just pointed out; the mucous membrane is also reddened, thickened, and occasionally smeared with a puriform mucus; it is also sometimes ulcerated: the epiglottis is thickened and often erect. There are, commonly, venous congestion throughout the body—extensive engorgement of the lungs, and commonly of the right side of the heart—signs characteristic of the mode in which this disease proves fatal,—namely, by apnœa. The diagnosis of laryngitis is fortunately not very difficult, as it is of the greatest consequence that the disease should be early recognized in order that it may be promptly treated. The loss of voice, and spasmodic breathing of hysterical females may be distinguished from it, by the ordinary signs of hysteria, and by the absence of the signs of inflammation. A common sore throat or hoarseness may indeed be mistaken for this disease, or what would be worse, the latter may be regarded as a case only of the former. Now, although the common sore throat, which is a disease of no danger, does no doubt depend upon inflammation of the mucous membrane of the larynx, it is unattended by either the inflammatory fever, the general restlessness and anxiety, or the early occurrence of spasmodic breathing, which characterize laryngitis. Where the two former of these occur in sore throat the case should be carefully watched, and the first appearance of the latter ought to excite great alarm. From cynanche trachealis, or croup, laryngitis may be distinguished partly by its affecting generally adults, whereas the former disease is almost exclusively one of infancy or childhood; and partly from there being no difficulty of swallowing in croup: in cynanche pharyngea, on the other hand, there is difficulty of swallowing, but not of respiration. Tumours, again, whether produced by abscess, aneurism, swollen glands, or other morbid growth or enlargement, may, by pressing either upon the larynx or trachea, or upon the nerves by which those parts are supplied (as when the recurrent nerve is pressed upon by an aneurism of the arch of the aorta), give rise to symptoms resembling those of laryngitis, and hence have been mistaken for it. The possibility of the existence of any of these should always be borne in mind; and a careful examination of the throat and of the condition of the heart and large arteries as far as the state of the patient will allow, should always be instituted.

The causes of acute laryngitis are exposure to cold or damp, or to both together: in some seasons it would appear to depend in part upon an epidemic influence; it may also be excited by mechanical or chemical irritation of the larynx or glottis; and a not unfrequent cause amongst children is the inflammation set up about that part by the swallowing of scalding water. It may also be induced, as has been already noticed, from the extension of the inflammation of cynanche tonsillaris to the larynx, or arise in the course or at the termination of scarlatina, measles, small-pox, erysipelas, and sometimes of rheumatism.

The prognosis is generally unfavourable in acute laryngitis, the disease proving fatal in a great number of instances. We must not, indeed, despair under favourable circumstances, and in good constitutions, of saving our patient, notwithstanding the severity of the disease; especially when remedies can be promptly applied at its commencement; but if much time has been lost, and the patient is of a feeble constitution, apparently of a cachectic habit, or the subject of visceral disease,—circumstances which favour the effusion of serum into the areolar tissue, the probability of recovery is exceedingly small.

It must have been inferred, from what has been already said, that the treatment of acute laryngitis should be prompt and decisive. The disease is an acute inflammation, and therefore calling for antiphlogistic measures; and it is also one which, from its dangerous position, it is most desirable to subdue, if possible, before it reaches that stage in which the truly inflammatory effusions take place; since it is from these that the chief danger arises. It is, however, an inflammation of a mucous membrane, and consequently one less directly amenable to the effect of blood-letting than those of some of the other tissues: it is, on the other hand, to be remembered, that blood-letting, when applied at too late a period, or when there exists an anæmic, or rather spanæmic state of the system, favours the effusion of serum, by rendering the blood still poorer, and thus inducing the form of the disease to be presently noticed under the term of œdema glottidis.

When, therefore, the patient is of temperate habits, apparently of good constitution, with no tendency to leucophlegmasia, or anæmia, and the pulse is firm as well as sharp, and the tongue white; bleeding in a full stream, until some decided impression has been produced upon the heart, and repeated in a few hours if the pulse and the general condition of the patient are such as to justify it, has often appeared to cut short the inflammation: and there can be no doubt, that, under such circumstances, it is the most efficient remedy at our disposal; but on the other hand, it more frequently happens that the persons in whom this disease occurs, are of previously unsound constitution, or weakened by previous disease, as when the laryngitis supervenes upon measles, scarlatina, or erysipelas, and in whom the use of the lancet would consequently be dangerous; or if this be not the case, the disease may be so far advanced as to have greatly depressed the system by the obstructed respiration, and consequent circulation of carbonized blood: or even if it have already existed some hours, or has been fully established, experience teaches that blood-letting is nearly inefficacious. It has been recommended by some authors to apply leeches to the throat, more or less, according to the state of the system or activity of the disease, in those cases, where, for the reasons assigned above, it might not be considered safe to bleed from the arm; or where, bleeding having been already performed, it might not be justifiable to repeat it; but there is one great objection to the use of leeches in this situation, namely, that it is apt to be followed by the effusion of serum into the subjacent areolar tissue, the occurrence of which, in that situation, is one of the dangers to be apprehended in this disease. Cupping at the back of the neck, as recommended by Dr. Watson, is certainly a preferable expedient.

Although blood-letting, whether general or topical, is not to be neglected in this disease, when it can be performed with safety, we are not to overlook other remedies which we possess as efficacious, and perhaps less dangerous. Amongst these, as applicable at the very earlier stages of the disease, must be mentioned an efficient emetic ; indeed, a moderately-full dose of antimony and ipecacuanha in the form already recommended (p. 170) will sometimes arrest at the outset attacks of a very threatening character. Our attention should next be turned to fulfilling those indications presented by the nature and symptoms of the disease, and these are to reduce the action of the heart and large vessels, to reduce, too, the increased action of the capillaries of the part, and determination of blood to them, and to allay the excessive nervous excitement of the part. These three indications are admirably fulfilled by the combination of antimony, calomel, and opium, already recommended in speaking of the treatment of inflammation. It should be observed, however, that as it is in the highest degree desirable to make an early impression upon the heart, and to maintain it, the antimony may be given in somewhat larger doses than there recommended, whereas the tendency of calomel to set up inflammation about the fauces, and to induce ulceration of the larynx itself, suggest the prudence of a more limited use of that remedy : for the opium again there is a special indication in the restlessness and anxiety of the patient, as well as the frequent paroxysms of spasmodic constriction of the larynx, and it may accordingly be more freely used, provided there be not much lividity arising from the impeded aëration of the blood, as it ought always to be remembered in this, as well as in several other diseases, that where this is the case, there is a diminished tolerance of opium. The best plan generally will be to give every three hours a pill composed according to (3, p. 108) ; in the interval to administer a draught, containing from half a drachm to a drachm of antimonial wine, with or without a few drops of tincture of opium, and the addition, if necessary, of a little sulphate of magnesia ; the antimony in the pills, or in the draughts, should also be gradually increased, until it produces a decided tendency to nausea. The too early application of blisters, which is objectionable in all inflammatory diseases, is in this case especially so, from the danger of producing infiltration of serum into the subjacent areolar tissue ; indeed it is more than doubtful if they ought to be applied to the throat at any period of acute laryngitis, though when the more active symptoms have subsided, a blister may be put upon the back of the neck. Flannel well wrung out in water so hot as almost to produce vesication, and applied to the throat when the paroxysms of dyspnœa are most urgent, often affords very marked relief.

In the treatment of acute laryngitis, it is indispensable that the temperature of the apartment should be kept uniformly at a moderately high standard; 65° of Fahrenheit is about the best, and from this it should never, if possible, deviate by more than one or two degrees; and perhaps it ought never to fall below it. By a steady perseverance in these means we may often succeed in carrying the patient safely through this most dangerous disease, which not uncommonly recedes just as the signs of the action of mercury upon the system are beginning to show themselves; but it must be admitted that the chances of doing so, where the inflammation has been fully established, are less than the chances against us; and that when the disease is in its latter stages but little can be effected by medicine. Under these circumstances, it may be justifiable, and more than justifiable, to perform tracheotomy. But though the operation has succeeded, it has often failed, the inflammation extending down the trachea; still the question as to its expediency in any particular instance is not to be lost sight of.

In simple acute laryngitis, the disease is situated, as already described, in the neighbourhood of the glottis and chordæ vocales; and, consequently, when it is threatening to be fatal by suffocation, it is here that the obstruction to the admission of air to the lungs takes place; and therefore if an opening be made below it in the trachea, air may pass into the lungs, and thus, the immediate cause of death being obviated, time is gained for combating the primary disease. It is, however, necessary to ascertain that the obstruction is limited to the above situation; and therefore before deciding upon the operation, the greatest care must be used to ascertain that the disease is not simulated by any of those which have been mentioned as liable to be confounded with it, and also that it is not complicated with inflammation of the trachea, in which case the operation would be productive rather of harm than benefit; or, with such mischief in the lungs as would render it useless. It may, however, be stated in recapitulation, that when the disease, upon most cautious examination, is found to be really laryngitis, and further that it is *solely* laryngitis, so far as to be free from any complication which would either add to the danger of tracheotomy, or render the operation futile, and if it seems to gain ground in defiance of the steady use of the means which have been recommended, it may be performed with a justifying chance of success.

Sound discretion is also required in deciding when it is to be performed; for intractable as this disease often is, it is not so certainly so, as to justify so formidable an operation before the trial of every treatment; but if it have resisted such treatment, and shows no sign of subsidence after about forty-eight hours, tracheotomy may be performed without waiting for the signs of impending suffocation; but should such signs appear at any time, it ought to be done without delay; and it may be added that under such, the operation ought not to be abandoned because it appears too late, since there have been cases both of what may be termed spontaneous laryngitis, and also of those supervening upon swallowing hot water, or other local irritation, in which the pulse had ceased at the wrist, and the countenance become perfectly livid, and where the pulse has returned and the lividity vanished, when air was admitted through the opening made by the surgeon in the trachea.

The inflammation of the larynx, which is excited by the attempt to swallow boiling water, not an uncommon occurrence amongst children, as it is intense, and apt to prove fatal very speedily, is a case in which tracheotomy is generally expedient; as it often is also in that form of the disease which occurs in the course of erysipelas and other eruptive fevers, where the active antiphlogistic measures required to subdue the inflammation cannot be tolerated, in the weakened state of the system.

Œdema of the glottis, which is to be distinguished from acute laryngitis, by the absence of the signs of active inflammation, and is characterized by a loud hissing respiration, happens, and that not very rarely, as a secondary consequence of other and sometimes remote affections. Thus it may take place from tumours pressing upon the large veins in the neck, as in aneurism of the thoracic aorta; and again in dropsy, arising from disease of the kidneys, it sometimes occurs very suddenly, and is one of the recognized modes in which that disease proves fatal. In such cases also we can have little hope from any other measure than tracheotomy, though this of course can only save life for a time.

The larynx is also liable to chronic inflammation, which renders the membrane injected, thickened, corrugated, and ultimately ulcerated; the perichondrium of the cartilages becoming also implicated, and leading to necrosis of the cartilages themselves. The same thing also happens to the epiglottis, which is occasionally partly destroyed, and thus rendered inadequate to the closure of the rima; and the lining membrane of the sacculi laryngis also becomes inflamed and ulcerated. This chronic form of the disease, which is more certainly though less speedily fatal than the acute, sometimes supervenes upon it. It also arises from syphilis, from the abuse of mercury, or even from a common sore throat induced by the ordinary causes, occurring in a patient whose constitution has been much impaired by the above or other causes. The chief symptoms are first of all hoarseness, subsequently loss of voice (the patient speaking in a whisper), owing to the injury of the parts about the larynx, wherein the voice, as distinguished from a whisper, is formed. There is also a ringing cough, with generally a copious puriform expectoration, and considerable emaciation ; this frequently continues to increase, hectic supervenes, and the patient dies with all the symptoms of phthisis pulmonalis, constituting what, in fact, is frequently spoken of as laryngeal phthisis.

This last form of the disease, however, is rarely an uncomplicated or even primary one ; the primary affection being generally in the lungs, and the laryngeal one is little more than a complication, or rather consequence, though often a very distressing one, of disease in those organs. When the chronic laryngitis, as a primary affection, proceeds to a fatal termination, there is increasing dyspnœa, total loss of laryngeal sounds, and ultimately of the power of articulation even in a whisper, difficulty of swallowing, the attempt at which often threatens to induce suffocation owing to the continually open state of the glottis, and the patient dies, either suffocated from the closure of the rima or of the larynx, by the thickened membrane, or exhausted by the protracted ulceration and starved by the impossibility of swallowing.

The only morbid appearances necessarily present in such cases, are the thickening and ulceration of the lining membrane of the larynx, and the ossification and necrosis of the cartilages already described.

The prognosis in this disease is, from what has been stated, unfavourable. When indeed it is merely a consequence of the acute disease, there is a reasonable hope of effecting a cure : when, however, it occurs in a previously broken constitution, especially one which has been impaired by syphilis or mercury, or, which is equally common, by both combined, and ulceration of the cartilages has taken place, little can be hoped for beyond palliation ; and in those cases which are merely complications of phthisis, the prospect is altogether desperate.

The treatment as well as the prognosis of chronic laryngitis must be guided mainly by the nature of the exciting cause ; in those cases which are the consequence of the acute disease, gentle antiphlogistic measures will still, no doubt, be occasionally required ; but these must, both in kind and in degree, be such as are not likely to lower the strength of the patient. A few leeches may sometimes be applied to the sides of the larynx, and blistering is not so objectionable here as in the acute disease, but it is far better to apply it to the back of the neck. Hot fomentations, however, and poultices are generally to be preferred as external applications, unless there be signs of fresh excitement indicating a return of acute or subacute inflammation. A mild mercurial alterative (20 *) will be of service for a short time, provided its action be carefully watched, and it be withdrawn as soon as the least effect is produced upon the gums, or the iodide of potassium may be given. A soothing anodyne mixture (21†) should also be employed at the same time.

A useful remedy in the treatment of chronic laryngitis, is the application of a strong solution of nitrate of silver, to the glottis, in the mode which has not inaptly been termed swabbing, by Mr. Vance, who introduced it ‡ This is performed by passing a piece of sponge saturated with a strong solution of nitrate of silver down the throat (if no violent spasmodic action be excited), and pressing it against the upper surface of the larynx.

In what may be termed the cachectic form of chronic laryngitis, our chief reliance must be placed upon restoring the strength of the constitution; and perhaps the best means for this end will be country air, or the sea-side, in a tolerably sheltered situation; and the beneficial effect of these may be aided by the iodide of potassium, with sarsaparilla or cinchona, or mineral acids with one of the latter: the action of the skin also, which is of great importance, may be improved by an occasional warm bath.

When there is increasing dyspnœa, and threatened suffocation from the thickening of the lining membrane, the operation of tracheotomy affords the only prospect of prolonging life, though but for a short time. Still, the present relief, and addition of a few days, or it may be a few weeks, or even months, to life, are not to be disregarded.

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* (20) ℞ Liq. Hydr. Bichlorid. ʒvj.
Tinct. Cinchonæ co.
—— Rhei. co. āā ʒiii. Misce.
Sumat ʒi—ʒii. bis vel ter die, ex aquæ pauxillo.

† (21) ℞ Pot. Nitrat. ℈ ij.
Tinct. Camph co. ℥ ss.
Oxymel simplicis, ℥ iiss.
Aq. puræ, ℥iij. Misce.
Sumat cochl. j. ampl. 4^{ter} in dies.

‡ Watson's Lectures. The strength of the solution may be five grains to a drachm.

CROUP.

Nearly related to laryngitis, is the croup, cynanche trachealis, or tracheitis. This disease is to children much what the former is to adults, though it differs from it in many important respects. Like laryngitis, it is sudden in its attacks, and often speedily fatal; like it, too, it produces death by opposing the passage of the air to the bronchi, but it differs from it in producing this obstruction not by swelling of the lining membrane, but by the effusion of a plastic deposit upon it; it also differs in its seat, as it occurs in the trachea, and, which renders it doubly formidable, it is very apt to extend down into the bronchi. It is, too, a disease of children, occurring almost exclusively between the periods of weaning and puberty, whereas laryngitis, though it may occasionally happen to children, is almost entirely confined to adults.

The croup consists essentially in intense inflammation of the mucous lining of the trachea, leading, if unchecked, to the effusion of a layer of solid albuminous matter, which obstructs the trachea, and causes death by suffocation.

The course of the disease has been variously divided by authors into steps or stages. It is, however, important for practical purposes to recognize three only, viz., the premonitory stage, the stage of confirmed inflammation, and the stage of impending suffocation.

The premonitory stage, though generally present, may sometimes be so slightly marked as to escape observation; or at others it is very transient, being only of a few hours' duration, but in most cases it occupies a period of nearly two days. The child is commonly attacked with the ordinary symptoms of common catarrh, with perhaps a greater degree of febrile disturbance than attends the latter disease: thus we have chills, followed by heat of skin, lassitude, loss of appetite, a rather flushed countenance, and increased hardness of pulse, with headache, sneezing, coryza; and, in addition to these, a short cough and a hoarseness, which, even at this period of the disease, gives to the voice a peculiarly harsh and metallic character. This latter symptom is, however, often wanting, and as to the rest, they at times present no distinctive characters by which the croup can at this period be distinguished from a common catarrh. In very young children the only premonitory symptoms may be restlessness, flushing of heat on the surface, a short, frequent cough, sleeplessness at night, and uneasiness about the throat, manifested by the frequent application of the hand to the part.

We have seen that there are no very decided signs, certainly no distinctly diagnostic ones, by which the premonitory stage of croup may be recognized; at the same time, we may generally be enabled, by the aggregate of the symptoms, to suspect its approach, and take measures for its prevention; and it may be well to bear in mind that in young children catarrh seldom causes hoarseness, and therefore, that where the latter is superadded to catarrhal symptoms, in the absence of any difficulty of swallowing, or distinct tumefaction about the throat, we should never omit to warn the parents or friends of what may be apprehended; and this the more, if it occur in a child who has evinced a tendency to the disease, or even in a family, or a district, in which it is prevalent.

Unfortunately, it generally happens that medical aid is not obtained until the disease is nearly fully developed; when we have hoarseness, if it have not been present before; or the previously existing hoarseness has assumed a peculiar thrill, or cracked sound, or the voice disappears altogether: this last, however, would indicate that the inflammation has extended to the larynx. The characteristic cough of croup now begins to be heard; this is perhaps most aptly described by the expression "tussis clangosa" of Cullen; it has been compared to the barking of a puppy, or coughing through a brass tube; it is not, however, very readily described, though it may be easily recognized by any one who has heard it. The inspirations following the cough are slow and hissing, or accompanied by a crowing sound. The respiration between the fits of coughing is much obstructed, and each inspiration is attended with the hissing or crowing sound just noticed; the expiration is quick, but less difficult than the inspiration; the head is thrown back, and, at each act of inspiration, the pomum Adami is forcibly drawn down towards the sternum; the countenance is congested and turgid, and sometimes bedewed with perspiration; the skin is hot, the pulse sharp, and the tongue white; there is little or no expectoration. The bowels are constipated, and the urine scanty. The above symptoms generally come on towards evening: often when the patient has been affected during the previous day with the signs of the premonitory stage, he is attacked by them in the night on waking from sleep; they often subside towards morning, and the remission continues through the day, but towards evening, or again upon awaking from sleep, they return with greater severity than ever; the dyspnœa is aggravated, and croupy cough and breathing more marked;—the countenance congested, the cheeks more livid, and the eyes more turgid;—the pulse, which continues sharp, becomes very frequent, small, and contracted;—the voice becomes feebler, and more whispering;—the cough, up to this time dry, or attended with scanty mucous or sanguineous expectoration, becomes husky, with frequent efforts to expel what is felt to be in the trachea: if, however, vomiting follow, and especially if it give rise to the excretion of albuminous or membranous matter, a considerable relief is often obtained; this relief may, indeed, be only momentary, but sometimes it is the commencement of a gradual subsidence of all the symptoms. The signs afforded by auscultation are, a louder sound over the trachea; diminished respiratory murmur over the chest, but good resonance on percussion. When, however, the disease has extended down the bronchi, there is, in addition to the above, bronchial or tubular respiration.

The above symptoms are rarely continued, but present remissions, as above stated; if, however, the disease do not subside, or is unchecked by remedies, these remissions become less and less; and their disappearing altogether may be said to characterize the stage of impending suffocation, which is also marked by increased frequency and difficulty of respiration, and failure of the moving powers of the circulation—the voice and articulation becoming nearly lost, the laborious action of the muscles of respiration, and expansion of the alæ nasi more marked, and the pulse feeble, irregular, and even intermittent. The eyes are now sunk and glassy; the head thrown back; the countenance dusky; the skin cold, and bedewed with a clammy perspiration; the tongue loaded and congested; the tips of the fingers livid; the veins deeply marked, and those about the neck distended. It may happen that, even in this apparently hopeless stage of the disease, a copious expectoration takes place, in which some membranous matter is excreted, and the breathing is relieved, and the other urgent symptoms subside; it more commonly happens, however, either that the child sinks exhausted, or is suffocated in a violent paroxysm of dyspnœa; or it may be that he is carried off by convulsions arising from congestion of the brain.

The most remarkable, and indeed the essential morbid appearance upon dissection after death, is an albuminous or fibro-albuminous layer, which occurs either in separate patches, or in the best-marked cases, as an uniform membrane lining the whole of the trachea, and sometimes extending far down the bronchial tubes: this membranous layer must not, however, be confounded with the layers of plastic lymph, which occur upon the surfaces of inflamed serous membranes, since it is incapable of organization, and may be readily detached from the surface on which it is poured out.

Such are the symptoms and progress of the disease, in what may be termed its most acute and perfect form; in such cases the pathology may be readily understood. Croup in this form is, as was stated at the commencement, essentially an intense inflammation of the trachea. This inflammation, like others, is at the commencement attended with congestion and consequent turgescence of the part, and diminution of its secretions; during this condition we have the beginning of the dyspnœa, the harsh, husky voice, and dry cough: and the larynx is often more or less involved in the inflammation; and when this is not the case, it is apt to be spasmodically affected by the irritation existing in the trachea. This congestion may be for a time relieved by the occasional increase in the secretion of the part; and with it the dyspnœa will be relieved also: as the disease proceeds, however, the peculiar effusion of the inflammation begins to show itself; this, in the present instance, where the inflammation is intense, and involving the submucous areolar tissue, contains a considerable portion of fibrine, which gives it a filamentous or membranous appearance, and prevails to so great an extent as to line the trachea with a continuous layer. Now the effect of the presence of this membranous matter in the trachea, must be much the same as that of a foreign body (which indeed it is) in the same situation; and hence the frequent paroxysmal and suffocating efforts to clear the tube of what is felt to be lodged there; these efforts being always attended by spasmodic contractions of the larynx. The consequences of this mechanical obstruction of the trachea, and frequent spasmodic closure of the glottis, are too obvious to require to be minutely detailed. They may be summed up as, imperfect aëration of the blood, and engorgement of the lungs, of the right side of the heart, of the portal system, and of those organs which return their blood by the ascending cava,—hence the lividity, the dark stools, and scanty urine—also venous engorgement of those parts which return their blood by the descending cava—hence the livid countenance, the venous congestion of the brain, particularly at the base and medulla oblongata, and occasional occurrence of convulsions towards the close of the disease,—death by apnœa.

As the true croup sometimes makes its attack very suddenly, and gives rise to membranous effusion very quickly, it may prove fatal in the course of twenty-four hours; the most common time, however, for a fatal termination, is on the fourth day. It varies also in other cases from two or three to eight or even nine days, the inflammation not subsiding immediately after the expulsion of the membranous effusion; sometimes, too, it exists in a less active state, and, according to some authors, gives rise to ulceration; from this chronic form the patient may recover by judicious management, though he often sinks after a period of some weeks.

In the explanation of the various modifications of croup. it is necessary to keep in mind the nervous sympathy which exists between the trachea and the larynx, the exquisite sensibility of these parts, and also the abundant supply of nervous influence to the larynx, and its consequent liability to spasmodic excitement. This spasm may be excited not only when the larynx itself is the seat of inflammation or irritation, but when those parts, with which it is connected by the reflex nervous action, are so affected; and also when any cause of irritation exists, either at the extremities, or along the course, of the incident or reflected nerves, or at the convergence of both in the nervous centre. These facts, duly considered, may do much towards removing the confusion that has arisen between the acute and severe croup of which we have just been treating, and other diseases which, in respect at least to some of the most obvious symptoms, are very nearly allied to it.

In the disease which has just been described, there exists a double cause of spasmodic action of the parts about the larynx, — 1st, the inflammation in the trachea, and 2ndly, the membranous effusion which is the product of that inflammation, which acts as a foreign body, both opposing the access of air to the lungs and exciting efforts for its own dislodgment, which efforts are attended by strong spasm of the muscles about the larynx, and are from that circumstance often ineffectual. We should, however, expect *à priori* that there would sometimes occur inflammation of the lining membrane of the trachea, not proceeding to the membranous effusion, but exciting considerable spasm about the glottis and neighbouring parts, resembling what occurs in the earlier stages of croup; and also, that there would occur such spasm, arising from some cause of irritation—other than inflammation at the extremities, either of the incident or reflected nerves—existing elsewhere along the course of those nerves, or in the nervous centre from which they proceed.

Accordingly, we do meet with a form of disease, in which there are the inflammation of the trachea and the spasm, but without the membranous effusion; this is the mucous croup of some authors, though others have confounded it with the true spasmodic croup, "laryngismus stridulus," or child-crowing of Dr. Gooch, which is essentially a non-inflammatory disease, being the result, in its purest form, not of disease of the larynx or trachea, but of irritation either in the brain or medulla oblongata, or along the course of the nerves supplying the former parts.

The mucous croup commonly affects very young children, especially those who have been lately weaned, and is most frequently observed in such as are of apparently a leucophlegmatic temperament; its attack is rapid and severe, but not so sudden and violent as is that of the true croup; it is preceded by coryza and other symptoms of catarrh, but with little fever, and generally comes on in the evening, or in the night, with the invasion of a shrill ringing cough, and sibilant and very hurried respiration ; there does not appear to be much redness of the fauces, and the inflammation does not at the commencement extend down the bronchial tubes; these attacks generally recur on the following evening or night, but after the first or second day the cough is attended by a mucous rattle, and the fits terminate more speedily in the expectoration of a glairy mucus. The disease generally terminates in bronchitis. This form has been by some authors regarded as a bastard or spurious croup, but it is with much more justice considered as a milder form of inflammation by Dr. Copland and others. It is, in truth, an inflammation of the trachea, occurring in children in whom the nervous system is highly irritable, which circumstance, combined with the natural irritability of the parts affected, accounts for the disproportionate excess of nervous excitement.

In the true spasmodic croup, or child-crowing, we have no inflammation, and the spasm is to be explained upon the principle of convulsive action of a particular part, being frequently excited, not only by irritation—at the extremities of the nerves supplying that part,—of which inflammation of the part itself is one instance,—or in the course or at the origin of those nerves, as in the cases of morbid growths on the skull or vertebræ,—or disease in the nervous centres themselves; but also,—when it is seated at the extremities, or in the course of, nerves supplying parts whose action is associated with that of the part in question by a reflex action; as when the diaphragm and other muscles of respiration, are excited by irritation of the nares, or the former muscle thrown into spasmodic contractions, by irritation of the extremities of the pneumogastric nerve, in the case of hiccough, where the offending cause is in the stomach : but further than this, we know from experience, that in irritable subjects, and in certain morbid conditions of the system, convulsive or spasmodic movements may be excited in different parts of the system, by irritation propagated to the nervous centres from the parts where the irritation is set up, but thence reflected to parts not associated with the latter by any normal reflex functions, as in the convulsions of children from teething or gastric irritation, and in tetanus. Hence we have ample ground for the explanation of the phenomena of the "child-crowing," "laryngismus stridulus," or "spasmodic croup." The crowing respiration and its accompanying dyspnœa, which are the most obvious phenomena of this disease, occur in paroxysms between which there are intervals of tranquil respiration. The best description of this affection is that given by Dr. Ley. "When the closure of the chink of the glottis is not perfect (says he), the child struggles for breath, the respiration is hurried, the countenance generally bluish or livid, the eyes staring, and each inspiration is attended with a crowing noise. When the closure is more complete, the function of respiration is entirely suspended for a while; there is an effectual obstacle to the admission of air. The child makes vehement struggles, by some termed convulsive, to recover its breath. At varied intervals, from a few seconds up to a minute, or upon some occasions nearly two minutes, air is at length admitted through the glottis, now partially open, and this rush of air passing through a very narrow chink, produces the peculiar sound. To these symptoms not unfrequently succeeds a fit of coughing or crying, which terminates the scene; or if the glottis be not thus partially open, the child at the end of from two to three minutes at the utmost will be suffocated. Pallid and exhausted, it falls lifeless upon its nurse's arms, and it is then that the child is generally said to have died in a fit." It very often happens that the above symptoms are attended by convulsion of the extremities, especially of that form often associated with gastric irritation in children, namely, the contraction of the muscles of the wrist, thumb, and fingers, and of the ankles and toes, the thumb being strongly contracted upon the palm, and the foot so distorted as to have almost the appearance of club-foot.

The distinctive characteristics of this disease are the occurrence of the above symptoms, with the absence of fever and the perfect tranquillity of the respiration between the paroxysms. The explanation of these phenomena need not detain us long, as it is included in what has been already said of reflex nervous irritation and, indeed, all the most satisfactory ones which have been given, resolve themselves into this. That of Dr. Ley, for instance, wherein the temporary closure of the glottis is accounted for by pressure upon the recurrent, or some branch of the pneumogastric nerve, from enlarged glands in the neck, or within the chest, is but a particular instance of the general fact, of pressure or irritation in the course of the eighth or fifth pair of nerves, inducing spasm of the glottis; the same would apply to its being excited by offending matters in the stomach, or by the irritation of teething; and its arising from disease within the cranium, is but an instance of the cause of irritation existing at or near the origin of either of the same nerves. The presence, however, of enlarged glands in the neck may assist us much in the diagnosis of cases of this description, since not only may it be in itself the cause of disease, but shows the probability of strumous disease either in the glands of the chest or abdomen, or within the brain itself: it also indicates that state of nervous atony, in which irritation so produced upon these nerves would be most likely to excite the spasm of which we are speaking.

The last mentioned variety of croup does not strictly belong to inflammations of the larynx or trachea; neither is it for the most part a disease of those parts at all: we have, however, spoken of it in this place from its liability to be confounded with the true croup, and in order the better to consider the diagnosis of these affections. If it be borne in mind that croup is essentially an inflammation of the *trachea*, and that consequently the obstruction which it excites is to the breathing, and not the deglutition, we shall have no great difficulty in distinguishing it from the cynanche tonsillaris, the cynanche maligna, and the cynanche pharyngea; not to mention that the latter diseases may be recognized at once by an inspection of the throat, unless, indeed, they are of such severity as to prevent the opening of the mouth, which would of itself be a sufficient sign of the existence of one of these rather than croup. The eruptive fevers (more particularly measles) and whooping-cough, sometimes commence with a degree of inflammation about the trachea, which excites a spasmodic cough, and is attended with a husky voice, not unlike that of croup, especially of the mucous kind: in the case of the measles, the watery eye, the coryza, and the sneezing, soon point out the true nature of the case: in whooping-cough the distinction is not at first so easily made, but the diagnosis is of no great importance, since the tracheal inflammation, which really does exist, will require to be treated according to its severity; and when the latter disease is fully established, the character of the cough, so unlike that of croup, will at once mark the difference. The diagnosis from laryngitis is perhaps not easily made with certainty, though it is fortunately one of no great practical importance, since the treatment would be nearly the same in either case. It will assist us, however, to remember that laryngitis is mostly a disease of adult life, whereas croup is one affecting almost exclusively infants and children. The fixed burning pain of laryngitis, which is always referred to the situation of the pomum Adami, will also assist us at the commencement of the latter disease: and its further progress, unlike that of croup, leading to ulceration and suppuration, and scarcely ever to the effusion of false membrane, will enable us to recognize it in its more advanced stages. The chronic affections of the larynx and glottis, though they sometimes produce the croupy cough, voice, and respiration, may nevertheless be distinguished by their slower progress, and by their rare occurrence amongst children.

Œdema of the glottis may indeed suddenly occur in very young subjects, when there exists disease of the kidney, with a tendency to dropsy: but the presence of this latter disease ought at once to suggest the true nature of the affection. It is of the first importance not to mistake the earlier symptoms of croup for those of ordinary catarrh; but of this we have already spoken in describing the invasion of the former. Croup may supervene upon bronchitis, when its presence may be detected by its characteristic symptoms presenting themselves in addition to those of the latter disease; but there can be very little danger of mistaking between the two, as we shall perceive when we come to treat of bronchitis. Symptoms not unlike those of croup may be induced by the presence of foreign bodies in the larynx or trachea; the suddenness of the pain and suffocation, the change in the situation of the latter, the dryness of the cough, the violence and irregularity of strangulation, as well as the history of the case, will generally lead to the discovery of its true cause.

The greatest practical difficulty in the diagnosis of croup used to be, that between the different forms of the disease, especially that between the plastic croup and the child-crowing. The more correct knowledge of the latter disease which we now possess, and the recollection of its characteristic symptoms as already described, will now remove all serious difficulty. It may, in fact, be distinguished from the true croup by the age of the patient, generally from nine to fifteen months, but never, according to Dr. Clarke, beyond the expiration of the third year of the child's life—whereas the true croup is the most common after that age;—by the history of the case, and condition of the patient, generally presenting some cause of nervous irritation, as teething, gastric irritation, enlarged glands in the neck, a strumous diathesis, or a large or ill-formed head;—by the suddenness of the attack, and by its sudden departure;—and by the absence of fever, cough, and dyspnœa in the intervals between the paroxysms.

The difference between the first and second varieties of croup is one rather of degree than of kind—the fever in the latter is slight: it generally, too, attacks younger children than does the membranous croup, especially those who have lately been weaned. It should be remembered, however, that those children who have suffered from the true croup in early life are very liable to have such symptoms recur when they become the subject of a slight catarrh; but it is equally true that such symptoms may run on to an attack of the real croup, and therefore require watching, and, if necessary, prompt but not violent treatment.

As to the circumstances which conduce to a liability to true croup, it is pretty generally agreed that the greatest tendency to it exists in cold and damp situations, and particularly such as are liable to rapid changes of temperature; those seasons of the year in which such weather may be expected are also those in which, in this climate, it most frequently happens, viz., from November to April. There is, however, more difference of opinion as to the character of constiution which is most liable to it, whence we may infer that but little is certainly known respecting it. Some consider that florid and irritable children are most liable to it: thus Dr. Copland says: "The nervous and sanguine temperaments, or a mixture of them—the spasmodic characters predominating in the former, the inflammatory in the latter—with a tendency to a fulness of habit, seem to predispose to croup." It should, however, be recollected that there is not necessarily a greater tendency to inflammation in those inclined to plethora than in others; although those of a nervous temperament are undoubtedly more liable to nervine affections. It is certain, too, that in some families there exists a peculiar proneness to the disease, and that in certain seasons it prevails almost epidemically, though there is no ground for believing that it is ever contagious.

Those children who have once suffered from croup, have a greater tendency to the disease than others, in addition to a liability to croupy symptoms upon the occurrence of trifling irritation.

The mucous croup is influenced by the same external circumstances as the more severe form of the disease; it more commonly, however, attacks children of a leuco-phlegmatic temperament, and languid circulation. The external circumstances which seem the most to favour the attacks of the child-crowing or true spasmodic croup, are damp and low situations, the want of pure air, of light, and of wholesome diet; whatever, in fact, interferes with healthy nutrition, and the perfect elaboration of the blood, the disease being, in truth, one that particularly affects scrofulous children. It is by no means improbable that exposure to cold and damp, or to any of the causes which in stronger children induce the ordinary croup, may bring on an attack of child-crowing in those in whom, owing to a state of constitution of the character just described, there exists a predisposition to it; but the common exciting causes of the disease are those mentioned in the description of it, namely, irritation existing either at or near the base of the brain, or along the course, or at the extremities of the fifth or eighth nerves.

As croup is at all times a very dangerous disease, the general *prognosis* must be unfavourable, or at the best extremely doubtful; though in a child of good constitution, and in the early stages, we have a fair chance of success from a well-directed and persevering plan of treatment. The danger, however, is always very great, when from a sibilant respiration over the larger bronchial tubes, we have reason to believe that the inflammation has extended to them. We must also be exceedingly cautious in pronouncing our little patient out of danger, for as long as there exists any false membrane in the trachea, or even that excessive sensibility and irritability of the part which are the consequences of this inflammation, there is a possibility of obstruction, or of spasm of the glottis. The expulsion of a membranous substance, if followed by a warm healthy perspiration, and relief to the respiration, is at all times a favourable symptom; whereas, the increased length of the paroxysms of dyspnœa, with diminution of the interval between them, the failing pulse, lividity of countenance, and clammy perspiration, with the other symptoms already mentioned as indicative of the last stage of the disease, can be regarded in no other light than as signs of the greatest danger, if not of impending death. The mucous croup, as long as it continues such, is not a disease of much danger; but even here our prognosis must be very guarded, as it may speedily pass into the severer form of the disease, and it is upon its tendency to do so that its danger depends.

The child-crowing, though merely a spasmodic disease, is not upon that account to be regarded as free from danger; for not only may death, as we have seen, take place by suffocation during the paroxysm, but the long suspension of the respiration may give rise to congestion, leading to serious disease in the brain, lungs, or heart.

The first object in the *treatment* of croup should be to check the inflammation, and thus, if possible, arrest the disease, and prevent the formation of the inflammatory product, constituting the false membrane, or albuminous deposit, obstructing the air-passages. If, however, we are too late, or unable to effect this, we must endeavour to induce the removal of these inflammatory products; and thirdly, we must endeavour to allay the nervous irritability upon which the spasm attends.

The most effective means at the commencement of the disease for fulfilling the first of these indications, is an emetic sufficient to produce full vomiting; for this purpose the tartar emetic is to be preferred to ipecacuanha, though, perhaps, it may be better to use a combination of both: thus from a quarter of a grain to half a grain of the former, with from three to twelve or fifteen of the latter, according to the age of the child, will generally produce full vomiting, the consequence of which will often be the expulsion of thick glairy mucus, and in some cases of shreds of false membrane, followed by free diaphoresis, and great relief to the respiration. The relief following the exhibition of the emetic is sometimes so great as to lead to the belief that the affection has been entirely spasmodic; but the effect of an emetic, even at an advanced period of the disease, may be so striking as to leave no doubt of its efficiency in cases unquestionably inflammatory. It is only in the commencement, and when it is somewhat doubtful whether the attack will prove one of the more severe membranous form of the disease, or of the second and milder one, that an emetic should be trusted to as the primary remedy, and before bleeding has been performed either locally or generally. When, however, the patient is seen thus early, we may have recourse to it in the first instance with a fair chance of success. It should be observed, moreover, that there is generally a great tolerance of emetics, and that much difficulty is often experienced in effecting vomiting; and when this is the case, it will be well to repeat the emetic, though in a smaller dose, perhaps half that administered in the first instance, at the end of an hour's time. The vomiting, when it has been obtained, will commonly be followed by free action of the bowels. When, however, this does not take place, measures should be taken to insure it, as most marked relief often follows free purgation: a very good practice will often be to keep up a slight degree of nausea, and moderate action of the bowels, by a combination of tartar emetic and sulphate of magnesia; after the disease has yielded to these measures, slighter spasms will frequently occur, and these will be best met by the application of flannel cloths wrung out in hot water, so hot as to produce great redness, or even a slight degree of vesication.

When, as most commonly happens, the patient is not visited for many hours after the attack, and there are reasons from the symptoms to believe that the second stage, that, namely, of membranous effusion, has already commenced, or is upon the point of doing so, we must not delay to abstract blood in such quantities as the degree of fever, the sharpness of the pulse, and the age and constitution of the patient seem to call for or to justify. In children above the age of four, or sometimes even younger, we may often practise venesection with tolerable ease and success, sometimes by opening a vein in the back of the hand, and where this mode of abstracting blood is practicable it is to be preferred, at this stage of the disease in its severer forms; as the effect produced upon the system is more speedy and more certain, and the quantity of blood drawn can be more accurately estimated; for a child of three years four ounces will be a pretty full bleeding, and an ounce may be added for every additional year. In older children, or where it is not practicable to open a vein, cupping between the shoulders may be practised with advantage, the same rule as to the quantity of blood taken being observed as in venesection. In speaking, however, of these rules, we ought to premise that they are only approximations or averages, and that much must be determined by the fever, and apparent strength of the individual child. In infants and very young children, where we are obliged to have recourse to leeches, we may observe nearly the same rule: thus Dr. Watson recommends "the application of a couple of leeches to an infant in its first year, and an additional leech may be employed for every additional year." These leeches should also be applied over the first bone of the sternum (not *above* it, and along the course of the trachea, as is recommended in some works); since independently of the objection stated in speaking of the use of leeches in laryngitis, we ought in *no case* to apply leeches in children where we should be unable to apply pressure to stop the bleeding when necessary; in fact, we ought not wantonly to neglect this precaution in patients of any age.

After the bleeding as recommended above, we should, before repeating it, have recourse to emetics and purgatives, which may be employed much in the manner already described, when speaking of their employment in the first instance; and here, as before, it will be expedient to administer a purgative, in the form perhaps of calomel and jalap, if the same effect have not been produced by the emetic. It will be afterwards desirable to keep up the nauseating and depressing effect of the antimony upon the system; as by so doing we diminish the force of the heart's action, and probably also the activity of the capillary circulation, and thereby, the supply of blood to those vessels whence the effusion of the membranous matter takes place: the best mode of effecting this is to administer the tartar emetic at moderately short intervals. About a quarter of a grain in a dessert-spoonful of water may be given every hour to a child of six years, and the frequency and quantity increased or diminished according to the effect produced both as regards the nausea, and the force and frequency of the pulse. The failure of the strength of the pulse will generally be attended with relief to the difficulty of breathing; but if with the returning force of the former the latter return also, recourse must again be had to the antimony; the collapse induced by which remedy is often so great as to threaten death from exhaustion, in which case a little brandy, or a few drops of sp. ammon. co., should be administered. About a grain of calomel may at the same time be given every three or four hours. It may be well to remark, however, that many of the best authors recommend the exhibition of this remedy in larger doses, and some the combination of it with the antimony in the form of powders; but the antimony appears to be the remedy which, of all others, has the most powerful effect upon inflammations of the mucous membranes, and therefore it is better to administer it in the form which will be most readily and certainly taken; and this it will be in solution, since, from being tasteless, it may be given to a child of any age as a drink, without his being aware that he is swallowing medicine, whereas there is often much difficulty in the administration of powders, and the struggling which attends the forcing them down is injurious. We would not, however, be understood as setting no value by the use of calomel; it probably diminishes the tendency to the effusion of the membranous matter, and perhaps, where it has taken place, it favours its separation. It is therefore best to rely mainly upon the known beneficial effects of the tartar emetic, and at the same time, where it can be done, to administer the calomel as an auxiliary remedy. In older children, the Dover's powder, in doses of about a grain, or a grain and a half, may be combined with the calomel, and in younger, a little extract of conium, or of hyoscyamus may be given in the mixture, disguised with a little syrup, provided only it can be readily administered, as any excitement, in swallowing it, would more than counteract the good effect of the anodyne. An admirable sedative, however, in the paroxysm of dyspnœa will be the use of the *hot* fomentations already recommended. Blisters are on every account objectionable. A most important adjuvant in the treatment of croup is the keeping the apartment at a steady temperature, about 65° Fahr.; the child should also be kept as quiet as possible, and when he is sufficiently old or intelligent should be urged to refrain from speaking.

When the symptoms are those of impending suffocation, the prospect, as may be inferred from what has been stated already, is nearly hopeless. Cases of this kind have, however, sometimes, though rarely, recovered under the use of squills and ammonia, with conium or henbane, and a little wine; but the symptoms are most generally fatal. The question remains, then, Are we in such cases to endeavour to save the life of the patient by the operation of tracheotomy? Not only theory but experience also is against the probability of success from such an operation, and were it not for its having succeeded in two or three well-authenticated cases, it might be pronounced an unjustifiable operation. It has, however, succeeded in this very small number of cases, but it has failed in numberless others. The reason of the very small success which has attended this operation in croup, compared with that which has resulted from it in laryngitis, is not to be found in the greater difficulty of the operation in children than in adults (though that is not to be altogether disregarded), since it has been performed with safety and success in cases of inflammation of the larynx caused by boiling water or irritating fluids, and also without any serious result in cases of *supposed* membranous croup, but upon the fact of the membranous effusion most commonly taking place in the trachea, and along the course of the bronchial tubes, reaching even to their finer ramifications. The only cases in which it can succeed are the very rare ones where the false membrane does not extend more than half an inch below the cricoid cartilage; and those in which there is little or no false membrane, but the impediment to the breathing has arisen from thickening of the mucous membrane, and accumulation of viscid, reddish mucus (which often occurs in the mucous form of croup) about the narrowest part of the trachea, which accumulation cannot perhaps in some cases be expelled from the impossibility of getting air enough behind it to force it out. These are conditions the existence of which it is unfortunately next to impossible to ascertain. Where, however, croup comes on very suddenly, characterized by the croupy voice and speedy threatening of suffocation, it is probable that the disease does not extend far down the larynx, and the operation may be performed, the best excuse for which is that if it afford but a bad chance, it is almost the only chance.

It may be well again briefly to recapitulate the chief points in the treatment of this formidable disease. At the commencement, in children who are not very robust, endeavour at once to arrest its progress by emetics of potassio-tartrate of antimony, followed by nauseating and depressing doses of the same medicine, and if necessary by a purgative. In more robust children in the country, and when the disease is verging on the second stage, bleed and then adopt the same plan, adding the calomel; and if the disease continue to resist this mode of treatment, and the antimony appear to depress more than is consistent with safety, push the calomel. If all other remedies fail, and suffocation appear imminent, tracheotomy is admissible, or rather justifiable, though only when there is no apparent hope from any other course; not that the operation is in itself a very dangerous one in skilful hands, but for the reasons assigned above, and also because in cases where it is not called for by the imminent suffocation, the irritation of the trachea which must attend it, as well as the direct admission of cold air into that tube, cannot but aggravate the existing inflammation: it is on this account essential, when the operation is resorted to, that the temperature of the room should be raised to 80° or 85° Fahr., and the air kept tolerably moist by the presence of vessels of warm water, exposing a considerable surface for evaporation.

The treatment of the spurious or spasmodic variety may be inferred from what has been said of its cause: it will, however, be more fully understood when we have spoken of those diseases of which it is in reality but one of the symptoms: attention to the gums is the first consideration, and if they are swollen, or if there are any teeth nearly through, they should be freely lanced. The state of the alimentary canal should also be carefully investigated, and moderate doses of castor oil or of rhubarb and magnesia administered if there be reason to apprehend the presence of irritating matter; *purging* is, however, to be carefully abstained from. The cervical glands must next be attentively examined, and if enlargement be found we have not only detected a condition which may, of itself, be an exciting cause of the spasm, but which also points to the probable existence of other causes in enlarged bronchial or mesenteric glands, as also to a strumous condition of the system, which is one highly susceptible of this affection. Lastly, we must carefully examine the head, and inquire diligently into all circumstances which would indicate disease of the brain or its membranes. We see, then, that the treatment of this disease involves not only that of dentition and gastric irritation, but also that of the strumous diathesis, and of the diseases of the viscera of the head, chest, and abdomen.

During the paroxysm a warm bath will often prove serviceable, or, what is still better, the application of a sponge from which hot water has first been squeezed, or of flannels wrung out in *hot* water. It may be well, too, here to suggest, in addition to the treatment applicable to the particular lesion which is supposed to be at the root of the mischief, that nervine tonics and anti-spasmodics are specially indicated: and for this purpose the sulphate of zinc with a few drops of tincture of valerian, or the valerianate of zinc, are particularly appropriate: and also, to reiterate what has before been observed, that a certain amount of inflammation about the larynx or trachea may be the cause of the spasm, and therefore that we are not hastily to discard all antiphlogistic remedies merely because the disease does not present the unequivocal symptoms of membranous or even of mucous croup.

DIPHTHERITIS, OR DIPHTHERIA.

We have reserved for a separate notice a very severe and dangerous form of inflammation of the throat which has, during the last few years, attracted much attention in this country. It was about forty years ago very prevalent in several parts of France, and was described by M. Bretonneau, of Tours, under the name of diphtheritis, or malignant angina, and was by him regarded as a variety of croup prevailing epidemically. It has within the last four or five years, to all appearance, established itself in this country, where it has received the name of diphtheria, and has affected particular localities with an alarming fatality; sometimes carrying off a large proportion of the children of the same family, and often showing a strong partiality for particular situations and even houses.

This disease was, as we have already said, regarded by Bretonneau as identical with croup; and Dr. West, also a deservedly high authority in this country, speaks of it also as a variety of that disease.

To croup, in some points, it bears a strong resemblance, though in other respects it is as clearly distinguished from it. Like croup, it gives rise to a membranous exudation, but, unlike it, affects, in the first instance, chiefly the surface of the velum, the tonsil, glands, uvula, and fauces: though it may subsequently spread itself into the larynx, trachea, and even extend down the bronchi to their ramifications. There is, as in croup, great danger from the mechanical obstruction to respiration; but in diphtheria this is not the chief danger, since it as often, or even more so, proves fatal by asthenia, from the depressing character of the attendant fever.

The disease sometimes makes its attack with little or no warning, but generally there is a day or two of previous *malaise*, and other signs of incipient fever. Sometimes the disease supervenes or occurs as a complication of other disorders, particularly scarlatina or measles. The patient next complains of soreness of the throat, and upon examination flakes of lymph-like exudation may be detected upon the tonsils, velum, uvula, or fauces; this in most cases increases rapidly, so that upon the following day it may be plainly seen, like patches of chamois leather, coating considerable surfaces, and often investing the uvula like the finger of a glove. It often, too, seems to be deposited upon the posterior surface of the velum, or may be seen peeping out, as it were, from behind the curtain, between the edges of the velum and the uvula. Sometimes there may have been little or no complaint, except of a slight feeling of lassitude and an uneasiness about the fauces, when upon examination the appearances just described are seen in their fullest extent. In favourable cases these symptoms may pass away in a few days; when the patient gradually, but pretty quickly recovers: but in the more severe, death may ensue from exhaustion, through persistence of the fever, and difficulty in taking nourishment; sometimes, though more rarely, from suffocation by the false membrane; or, in some cases from œdema of the glottis. Sometimes, again, there may be sloughing of the throat; and, again, death may ensue from sudden asthenia; and it is worthy of note that this may happen at any period of this disease, and not very unfrequently when the patient is, to all appearance, going on favourably.

The fever is, as has been stated, of a lower type than in true croup. It is, in fact, as a general rule, adynamic, the pulse being quick and compressible, the tongue furred, but the fur is of rather a drab colour; and sometimes there are flakes of the (diphtherious?) exudation upon its surface as well as the interior of the cheeks. Another most important symptom, and one which bears upon the pathology of this disease, is, that in most instances, especially the more severe, the urine is albuminous. The intellects are commonly unaffected; and in some instances it has been remarked that the patient appeared in no degree to realize the idea of his being seriously ill. It should be remembered, however, that although there are generally these symptoms of asthenia about the fever, yet that the disease admits of great variety in this respect, and that it is important not to overlook this in determining upon a plan of treatment; so that whilst we keep steadily in view the tendency—the dangerous tendency—to asthenia, we should not overlook the activity of the fever at the commencement of many cases, calling for a less stimulating plan of treatment, and in some instances for one almost antiphlogistic.

The anatomical changes in this disease have been already described; they consist essentially of the membranous exudation. This, in some instances, is not confined to the fauces and palate; but affects also the mouth and tongue, and extends down the trachea into the bronchia; and it has been said by some to affect now and then other mucous surfaces, as the lining of the intestines, and the conjunctivæ; and to have been detected upon excoriated surfaces: so that the fundamental difference between this disease and croup appears to consist mainly in this, that whereas the latter is essentially a plastic inflammation of the trachea, the diphtheria appears to be a constitutional disease, of which the tendency to pour out this fibrinous exudation is the most prominent manifestation, and which tendency shows a strong preference for the pharynx and neighbouring parts, though it may also affect other mucous surfaces.

The diagnosis of diphtheria is, to those who have once or twice witnessed the disease, a matter of no great difficulty. From croup it may be distinguished by the signs which have been pointed out. Aphthæ may sometimes be confounded with it, but these are much more common on the tongue and lips than on the fauces. Simple cynanche may be distinguished from it by its characteristic symptoms, but it is not unlikely that diphtheria may occur as a complication of this disease.

We have already remarked that it may occur as a complication of scarletina or measles; Dr. West says more frequently of the latter. In this respect, his experience is opposed to that of the author, who has only twice seen it complicating measles; though he has met with it so frequently, in connection with scarlatina, or occurring under the same roof with it, that he was for a long time in doubt whether it might not be a variety of that disease; but his having seen it on many occasions unconnected with that disease, and even affecting those who had previously had it, compelled him to abandon this belief, and to regard it as an affection *sui generis*. At the same time, he is of opinion that the influence of the scarlatinous poison, as well as that of measles, is a condition the most favourable to the development of diphtheria. It is, however, easier to speak of the circumstances which favour it than of the cause of the disease itself; some practitioners have regarded it as highly contagious, but the number of those who have been exposed to it with impunity is opposed to the opinion of its being so in a great degree; at the same time, there can be little doubt of its having been taken in several instances from an affected person. A practitioner in the country, after visiting a patient at a distance labouring under this disease, became the subject of it, and in a few days died.

The epidemic character of the disease is certain; and although it does not always affect chiefly those localities which, from situation and defective drainage, might appear most favourable to the production of epidemics, but rather the reverse, yet it is not a little remarkable that in very many instances where it has manifested itself most extensively a drain poison has been obviously present. For instance, a middle-aged lady was within the last few days visited by the author; she had been staying at a hotel by the sea side, where she complained of bad smells, as from drains. She returned to her home in the neighbourhood of London, complaining of pains in her limbs and some sore throat, and became affected with well-marked diphtheria. One of the children of a much respected surgeon became affected with the disease at the same hotel, very nearly at the same time, and died. It would appear, then, as if the specific poison or influence often prevails in dry and elevated, and apparently healthy localities, yet that it is brought into activity (we had almost said precipitated) by the presence of drain poisons, and also of several morbid poisons, particularly the scarlatinous.

As regards the prognosis in this disease, it is, upon the whole, unfavourable. It is more unfavourable in children than in adults, though it is a mistake to suppose that it is peculiarly a disease of childhood. Great prostration, a very loose and compressible pulse, dyspnœa, and difficulty of deglutition, are unfavourable, as is also the presence of albumen in the urine. A great extent of membranous exudation is also unfavourable, more particularly if there be reason for suspecting that the windpipe is involved. It is remarkable, too, that the exudation presenting a cast of the trachea may be expectorated, with apparent relief for the time, and the patient afterwards die of sudden sinking. The absence or mildness of the above symptoms is proportionately favourable, yet the prognosis must still be very guarded, owing to the tendency to almost sudden death from asthenia, and that, too, when all seems to be going on favourably. It sometimes happens, also, when the disease has attacked one side of the fauces, and after extending mostly on that side, has subsided, and the patient has appeared convalescent, that there will be a relapse, the disease reappearing on the opposite side, and running a fatal course.

There has been some difference as to the treatment of this formidable disease. Bretonneau recommended the application of strong muriatic acid to the fauces, but this is a practice which has not been found successful in this country Some practitioners cauterize the affected surface repeatedly with the solid nitrate of silver; but this the experience of the author does not lead him to recommend; and it is, perhaps, worthy of consideration, that where there is albuminous urine, there is liability to œdema of the glottis, and therefore that needless irritation in that situation should be avoided. The frequent mopping of the part with a solution of nitrate of silver, of the strength of from 20 to 30 grains to the ounce, is a milder and no less efficient measure.

As regards general treatment, the character of the constitutional symptoms must be carefully watched, and if, at the commencement, there be no urgent signs of prostration, we may administer ipecacuanha, in doses of about 20 minims of the wine, to an adult, in a solution of chlorate of potass, *e. g.* (22).*

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* (22) ℞ Pot. Chlorat. ʒi.
Vin. Ipecac. ʒiss—ʒij.
Tinct. Hyos. ʒiss.
Syrup. Aurant. ʒiv.
Aq. puræ, q. s. Misce.
℥vij de quâ sumat part. 6tis quart. quāq. hor.

If, however, the pulse be very compressible, ammonia may be added, and the infusion or decoction of bark substituted for the water; and if there be nausea or much depression, the ipecacuanha should be withheld. Wine must also be administered as soon as signs of asthenia (of which the very compressible pulse is among the earliest) begin to show themselves; and this must be given according to its effects, not by measure. A bottle of port wine daily has several times been given with the effect merely of sustaining the pulse, to patients not much used to stimulants, and with a successful result. Quina may also be administered: under these circumstances, it may be combined with the chlorate of potass, which is strongly recommended as fulfilling the general indications of a saline without the depressing effects of the generality of such medicines. The sesquichloride of iron is also a valuable remedy (23).* The bowels should of course be watched, and, if necessary, a gentle aperient, in the form of a rhubarb draught or a little castor oil administered; but needless purging should be carefully shunned, as it wastes the strength of the patient.

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* ℞ (23) Quinæ disulphat. gr. xxiv—xxxiij.
Pot. Chlorat. ʒi.
Acid Hydroclorici dil. ♏ xl.
Syrupi Rhœad. ʒiv.
Aqua puræ, q. s. ut ft Mist. ℥vi.
Sumat part. 6tam 3tiâ vel. quart. quāq. hor.
Addere liceat, Tinct. Ferri Sesquichlorid. ♏ v—xv singulis doribus.

XII.

CATARRH AND BRONCHITIS.

The catarrh, common cold, or "cold in the head," is a disease so frequent in this country, that there can be very few, if any, who have escaped it altogether, and no great number who ever pass through a year, without suffering an attack of greater or less severity. Any lengthened notice of it must, therefore, be superfluous, although the mention of it cannot be altogether omitted, since it is intimately connected with important diseases, from which it is not at all easy to distinguish it.

Catarrh is essentially an inflammation of the Schneiderian membrane, and the mucous lining of the nares, extending thence upwards to that of the frontal sinuses, and through the lachrymal ducts to the conjunctivæ; posteriorily to the posterior fauces, and along the Eustachian tubes; and downwards to the trachea and large bronchi. It is commonly preceded by lassitude, and pains or aching, in the back and limbs; not, indeed, often of sufficient severity to excite the apprehension of severe illness, but a general feeling of *malaise.* These are quickly followed by a sense of weight and tightness across the forehead, soreness or weakness in the eyes, stuffiness, or obstruction in the nares, an uneasy feeling about the situation of the Eustachian tubes, and some soreness about the throat, and hoarseness or loss of voice, often with pain about the muscles of the neck; the tongue is also somewhat furred; there is thirst, and increased sharpness and frequency of the pulse. As yet there is no coryza or increased secretion from any part of the inflamed mucous membrane; we have, in fact, the signs of engorgement or active congestion which constitute the first stage of inflammation, and in which, as we have already observed, there is swelling, at the same time that the natural secretion of the part is generally arrested or diminished; hence we have the feeling of tightness and obstruction in the various passages lined by this membrane, and frequently a wish to expel something from the nares, although the sensation indicating its presence is attributable solely to the turgescence of the inflamed membrane; one consequence of this state of things is repeated sneezing.

In pure catarrh, as distinguished from bronchitis, the inflammation does not extend into the bronchial tubes, and, therefore, there are no abnormal respiratory sounds belonging to it as such: we consequently reserve our remarks upon the stethoscopic signs of inflammation of the bronchial membrane till we come to treat of those diseases of which it properly forms a part.

The symptoms above described, which are those of what may be termed the first stage of catarrh, generally continue about two days, when the characteristic effusion of inflammation begins to show itself: this, in the case of a mucous membrane, consists in an increase in its secretion, but there is at the same time an alteration in its character; it is not of the bland nature which belongs to it in health; it is serous, transparent, and glairy, and, from its acrid character, often excoriates the upper lip, constituting the coryza or excessive discharge from the nostrils, attended with frequent sneezing. There is often, at the same time, profuse lachrymation, whilst the fauces, velum, and uvula pour forth a like discharge, which irritates the glottis, and produces a short quick cough. During this period of the disorder, there remains more or less thirst and fever, and the appetite is commonly impaired.

This condition generally continues about forty-eight hours, and is the period during which the "cold" is most annoying to the patient; at the end of that time, if allowed to run its course, it passes into the third and last stage. The characteristics of this are a subsidence of the uneasy feelings dependent upon the turgid state of the membrane, and the irritating discharge from it, a cessation of the fever, and the pouring out of a secretion, of a thicker consistence, as well as more copious, than occurs in the healthy state. It consists, in this instance, of a bland, opaque, tenacious mucus, which is freely excreted from the nostrils, and often collects in the posterior nares and fauces, whence it is expelled in lumps of tough tenacious phlegm of a greenish or yellowish colour: as this proceeds the inflammation and irritation subside, and if the patient be not exposed to any cause likely to produce it afresh, the disease disappears in a few days.

"There is another form of catarrhal complaint, which has hitherto excited little notice, but which merits attention, not because it is in itself of a character to inspire the least alarm, but because it may be, and probably often has been, a source of much uneasiness, in consequence of being mistaken for something else. In this instance, the inflammation appears to be chiefly confined to the internal mouth, constituting what may be called *catarrhus stomatitis.* The whole of the mucous membrane appears highly injected, and sometimes slightly aphthous; the gums are red, swollen, and tender; there is occasionally a slight fulness about the parotids, and not unfrequently a greater or less degree of salivation; indeed, in some instances, the salivation has been profuse, and has been accompanied by a fœtor exactly resembling that arising from mercury. There is some, but seldom much, constitutional disturbance, and the patient generally gets well in a few days."*

The circumstances which are commonly said to predispose to catarrh, but which, speaking more correctly, render the individual more than ordinarily susceptible of its usual causes, are, a peculiar idiosyncrasy, the nature of which is not accurately understood—a delicacy and irritability of habit, often induced by overmuch indulgence, living in overheated apartments, and neglecting the bracing effects of fresh air, from a dread of the very evil which is thus rendered more probable; and perhaps more than all preceding attacks. The most common of the so-called *exciting*, or really direct causes, are, sudden exposure to cold, as to draughts of cold air, sudden changes of temperature, either from heat to cold, as in going from a heated drawing-room into the cold outer air, or coming in from a cold drive and sitting before a fire in a warm room; getting wet through, or not keeping the feet dry. Some persons are liable in the hay-season to a modification of catarrh, known as hay-fever, and which is ascribed to something emanating from the flowering grass. A disease of which one of the most prominent symptoms is catarrh, has, on several occasions, prevailed epidemically over a large portion of the globe, under the name of influenza, or epidemic catarrh: it is, however, as the experience of 1833, 1837, and above all of 1847-48, must have taught us, too formidable and fatal a malady to be thus lightly passed over, and must be reserved for a separate notice.

The prognosis of catarrh, as such, is of course generally favourable: the symptoms of catarrh are, as we have seen, sometimes the only ones which present themselves at the commencement of that formidable disease, the croup; and a neglected catarrh often extends along the bronchial membrane, till it becomes a severe bronchitis; but the prognosis is in that case the prognosis of the latter disease. It is also to be borne in mind, that, in persons disposed to phthisis or asthma, neglected or repeated attacks of catarrh are often the means of calling the morbid tendency into activity.

As regards the treatment of catarrh: it is not very often that this disease becomes the subject of our remedies. In almost every family there is some favourite treatment or regimen which is put in practice on such occasions. In general, rest in an equable temperature, with a light diet, and abstinence from stimulants, with the avoidance of the circumstances which excite the disease, will prove sufficient for a cure, or, at all events, allow of recovery in a few days. A catarrh, may, however, be often cut short, or its duration greatly shortened, by appropriate measures at the commencement; although the means which have been recommended are very different, and may seem opposite to each other. The safest and best plan, perhaps, when we are consulted early, is to advise a foot-bath, and going early to bed, a few grains of comp. ext. of colocynth. with a sixth of a grain of tartar emetic, and three of ext. of hyoscy., with a moderate saline aperient in the morning; and a mild diaphoretic draught, as three drachms of liq. am. acetat., with about half a drachm of sp. æth. nit. and ten or twelve minims of vin. ant. pot. tart. or vin. ipecac. in camphor mixture, three or four times daily. A continuance of this plan for two or three days, the drink being slops, the diet boiled mutton, with a light bread pudding, will generally effect a cure.

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* Bright and Addison, 'Elements of the Practice of Medicine,' vol. i., p. 172.

A mode of cure, not perhaps more agreeable, but having the advantage of not confining the patient to the house, is recommended by Dr. Watson upon the authority of Dr. Williams; it has been termed the dry plan of cure. It consists in abstinence from every kind of drink. "No liquid or next to none, is to be swallowed until the disorder is gone. The principle here concerned is that of cutting off the supply of the watery materials to the blood." Dr. Williams "allows, without recommending, a table-spoonful of tea or milk for the morning and evening meals, and a wine-glass of water at bed-time." This plan has certainly the merit of simplicity, its novelty is not so certain. "In gravedine autem," says Celsus, "primo die quiescere *neque esse neque bibere*, caput velare, fauces lanâ circumdare; postero die surgere, *abstinere a potione*, aut si res coëgerit non ultra heminam aquæ assumere." * Opposed to this is the more grateful *moist* cure, viz., about four glasses of sherry with sugar in a large quantity of warm water, light reading on the sofa for the evening, a foot-bath, and early to bed; or the still more agreeable one of a good dinner, and an extra glass or two of wine. The first of the two latter expedients will often prove effectual in the commencement of the disorder, but should never be put in practice when much fever is present; the latter should only be ventured upon in the more advanced stage, when the mucous excretion is thick and readily expelled. A very efficient remedy is a warm bath at the onset, and to some persons a not very disagreeable one is the eating twelve oranges.

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* Lib. iv., cap. ii.

A most important matter in connection with catarrh, is *prevention*. Now there are various means attempted for this; one is to heap flannel jacket upon chest-warmer, and outer garment upon outer garment over this, till the patient perspires freely under the weight of artificial integuments, and thus a free action of the skin, the best relief to the internal mucous membrane, is kept up; but if, in an unguarded moment, he expose himself to a draught of air, or keen east wind, with a greatcoat too little, his enemy is sure to seize the opportunity. A more rational mode of prevention is that of enabling the system to withstand the impressions of cold, by inducing such a vigorous state of the circulation as may counteract its effect on the temperature of the surface, or quickly restore the heat that is lost. The habitual exposure to variations of temperature, as in exercise in the open air, blunts somewhat the sensibility of the surface, and excites and strengthens the capillary circulation there; and the same end is attained by the exposure of the surface to a temperature lower than it is likely to be called upon ordinarily to encounter, but for so short a time as to avoid the danger of any ill effects from it. This may be done by cold bathing or sponging, or the use of the shower-bath. The latter of these has no doubt an excellent effect in enabling the system to resist impressions of cold, but it is liable to grave objections in many cases. In the first place, there is not in all persons sufficient strength to withstand the shock, or, in other words, sufficient power in the moving forces of the circulation, to restore activity in the capillaries of the surface, when it has been thus suddenly arrested; and in such cases there is no reaction or "glow" after the affusion, but, on the contrary, a chilliness, which is a certain sign that harm rather than benefit is the consequence. But we must also remember, that even where, to all appearance, a healthy reaction in the superficial capillaries follows the use of the shower-bath, there is a considerable stress thrown upon the ventricles of the heart, and that in persons of lax fibre, there is danger of some injury being inflicted upon this organ or its valves. Those, too, who are liable to any undue flow of blood towards the head, as indicated by headache with increased heat of the scalp, ought *not* to use the shower-bath, since the first and most powerful shock takes place upon the surface of the head, and the subsequent reaction there is consequently greatest. Persons, therefore, of languid circulation, of feeble muscles, or disposed to determination towards the head, ought not to use the shower-bath. The slipper-bath may be begun to be used with tepid water, in summer, and afterwards, by degrees, with cold; and thus many persons may be inured to its use, who would shudder at the very mention of cold water. There is, however, much trouble attending the use of this bath, and therefore it cannot be very generally employed; but there are few who cannot procure the luxury of a large tub or pan, in which they may sponge themselves, beginning with the extremities, then freely sponging the abdomen, chest, and back, and last the head, a practice which will have the prophylactic advantages of the shower-bath, without the risk either to the heart or the head.

BRONCHITIS.

We have dwelt somewhat at length upon catarrh, not so much on account of its importance considered by itself, as from its liability, if neglected, to lead to the more formidable disease bronchitis, or inflammation of the mucous membrane of the bronchi and their ramifications through the lungs. This disease is one of such frequent occurrence in this climate, that but few persons pass through life without one or more attacks of greater or less severity, and although, in ordinary cases, it is attended with little or no danger; in those of its greatest severity it is one of the most formidable diseases which we are called upon to treat; for, besides combating the more imminent peril of the acute stages, we must endeavour to prevent the remote consequences, since they include some of the most dangerous lesions, not only of the bronchial tubes and lungs, but also of the heart and liver, and, through them, of the kidneys and brain.

Bronchitis usually commences with the ordinary symptoms of inflammatory fever. There is considerable lassitude, pain in the limbs and back; the tongue is furred and rather disposed to be red at the edges; nearly at the same time, or very shortly afterwards, the character of the disease is announced by a feeling of irritation about the throat, with a sense of oppression which is mostly referred to the situation of the sternum, and gradually assumes the character of a rawness or even sharp pain, aggravated by coughing or taking a deep inspiration: the cough is short and frequent, and there is commonly at this period of the disease no expectoration, but the respiration is hurried, and performed with increased effort. As the disease advances, there is more decided febrile reaction, which in some cases is of great severity; the skin becomes hot, often dry, especially in the commencement, though sometimes it is moist throughout; the tongue is furred on the dorsum, but red at the tip and edges, and the papillæ commonly elongated; there is thirst and often headache, scanty urine, a frequent, full but compressible pulse. With the increase of the fever there is commonly an aggravation of the cough and dyspnœa; the cough being frequent and sometimes violent; and the respiration not only hurried, but accompanied with wheezing, and causing pain, often of a sharp character, referred chiefly to the sternum, though it may extend to different parts of the chest; but there is not as yet, necessarily, any expectoration.

The disease may now be said to have completed its first stage, and it may be well to consider for a moment the pathology of this period of bronchitis, both for the explanation of the symptoms, and for the right understanding of the changes which may be expected to follow.

Bronchitis consists, as has been already stated, of an inflammation of the mucous membrane which lines the bronchi, and their ramifications in the lungs; and the first effect of inflammation of a mucous membrane is an increase in the quantity of blood in the vessels ramifying immediately beneath the surface, with often some serous effusion into the areolar tissue, but a diminution rather than increase in the secretions of the surface itself. Now the effect of this state of things upon the bronchial tubes must be a swelling and dryness of the lining membrane, accompanied with heat and pain; conditions which fully account for the sensations which have been described as felt in the chest; at the same time that the tenderness of this membrane, which must render the inflation of the lungs painful, explains the distress with which the inspiration is accompanied.

There is, however, another aspect in which it is of practical importance to view this change in the mucous lining of the bronchia, and that is in its effects upon the physical or auscultatory phenomena of the chest. Now as regards the sounds elicited by percussing the chest, we know that the quantity of air in the cells of the lungs is not necessarily affected by this condition of the mucous membrane of the tubes, and consequently we should not anticipate that any great alteration would take place in the resonance; and experience shows the same thing, for we find, *cæteris paribus*, that the resonance of the chest does not vary from what it is in health

Let us now examine the effect which the above change in the tubes must produce upon the sounds of respiration. We have already (p. 158) described the sound produced by the air entering the cells of the lungs, and have pointed out that in health no sound is to be heard at the surface of the chest, from the passage of the air along the tubes, except in certain situations, namely, over the first bone of the sternum, and on the space between the scapulæ (p. 163); but if the tubes undergo the changes which have just been described, and their calibre is narrowed, and that irregularly, we shall have them converted into musical instruments, and hissing, whistling, cooing or snoring sounds may be expected to arise, according to the degree in which the canal may be diminished, and to its diameter on each side of the obstruction, and this is what we actually find to be the case. We hear on listening to the respiration in this stage of bronchitis two classes of sounds, the one which might be supposed to arise from the propelling air through small tubes, and includes the hissing, whistling, wheezing noises which are expressed by the technical term *sibilus;* and the other comprising the cooing, snoring, croaking sounds which are denominated by the term *ronchus.* These are the bronchial dry sounds of respiration ; and it is very important to become familiarly acquainted with them by experience, and to have correct ideas as to their cause. The various modifications of ronchus are such as would be produced by blowing through a cylindrical tube of some size, the bore of which is narrowed at any particular part, the *note* or tone depending upon the size of the tube, and the degree of obstruction. Ronchus thus belongs to the larger tubes, and is produced by partial narrowing of those tubes, either from the thickening of the lining membrane above described, or from the pressure of a tumour, or other morbid enlargement external to the tubes, or, which is very common, from the partial clogging of a tube by a piece of tough phlegm, such as might readily lodge in one of them when the moisture on the surface of the lining membrane is diminished. The first and last only of these conditions, indeed, belong to bronchitis : it is, however, necessary to remember that they may all equally produce a sound which has been too often stated to be peculiar to the latter disease.

When, again, air is forcibly blown through a very small tube, we have a hissing sound, especially if there is any narrowing or constriction in its course: now this is precisely what occurs when the inflammation has reached the lining of the smaller bronchial tubes, and rendered it tumid; the occurrence, then, of a sibilant noise in bronchitis, shows that the disease has extended to the minuter bronchia; and when it is heard over a very large portion of the surface of the chest, it indicates disease of a very formidable character.

We have, then, two classes of dry signs, the ronchus and sibilus; the former produced in the large, the latter in the minute tubes communicating with the vesicles: now the ronchus, which is produced in the larger tubes, cannot very materially interfere with the production of the respiratory murmur; but when it is present to a great degree it may prevent our hearing it by its own louder noise; it outroars it, as Dr. Watson well observes. Where, indeed, ronchus has been produced in a large tube, by a piece of tough mucus partially obstructing it, this obstruction may sometimes become complete, and then the ronchus, and the respiratory murmur in the part of the lung to which the tube leads, will cease together; we shall then have *silence* over that portion of the chest, but without any diminution of the resonance on percussion. This phenomenon, however, is not permanent, and may commonly be removed by coughing; and in this way it may be distinguished by its transitoriness from the same condition produced by emphysema. With the sibilant noises, however, the case is somewhat different; for when the mucous lining of the minuter tubes is swollen, the ordinary murmur of the air passing from them into the cells must be converted into a hissing noise, so that the morbid sound supersedes rather than masks the natural one, and the sibilus which, under this condition of the small tubes, attends the respiration, is altogether a new sound. Such, then, are the dry sounds indicating the first stage of inflammation of the large and small tubes respectively: we have described them separately, in order to their better explanation; but we as frequently meet with them combined as singly. It is more common, however, to have ronchus without sibilus than the latter without the former. When they coexist, we have every possible combination of groaning, snoring, cooing, hissing, and whistling.

After a time, varying from one or two to several days, or even a week, but generally a very short time, the inflammatory secretion begins to show itself, first of all in the form of a glairy mucus, of considerable viscidity and tenacity, and whilst this continues, the fever remains intense, and the dyspnœa, where a great extent of the membrane is involved, distressing; the disease being, in fact, at its height. The presence, however, of this secretion in the tubes, causes a considerable alteration in the stethoscopic signs, the sounds which attend the respiration being now of the moist kind, which we propose to designate *rattles*. It may, however, here be remarked, that though there is much force in the objection urged by Dr. Watson against the term *mucous rattle*, adopted from the French, as descriptive of the moist sounds of bronchitis, viz., that we cannot tell by the sound itself that it proceeds from mucous rather than any other liquid in the air-passages, still the term *rattle* has been retained, as distinctive from the dry sounds of the tubes ronchus and sibilus, and as preferable to the term "crepitation," with which Dr. Watson proposed to replace it, and which appears best fitted to express another class of sounds to be described hereafter. By this term rattle, then, we mean the sound produced by the rapid formation and bursting of air-bubbles, caused by the passing to and fro of the air through the bronchial tubes loaded with fluid, whether this fluid be the glairy, viscid, secretion of the first stage of bronchitis, of which we are now speaking, or, more fully-formed mucous, puriform fluid, serous exudation, or even blood. Corresponding to the ronchus, or dry sound in the large tubes, we have the large rattle, formed, apparently, by the greater size of the bubbles (*râle muqueux à grosses bulles* of Laennec); and, to the sibilus, the small rattle, arising from the smaller size of the bubbles formed in the minuter tubes. These sounds have been described separately, as it is of practical importance to attend to the difference between them, as well as the almost opposite conditions of the mucous membrane, which they indicate. It generally happens, however, in practice, that the dry stage of the inflammation does not continue long throughout its whole extent, but is in many parts speedily succeeded by that of increased secretion, giving rise to the various rattles, so that, in fact, we most commonly hear the dry sounds ronchus and sibilus coexisting in the same lung with the large and small rattles. Here, too, it may be observed, that we have described these rattles once for all: we shall have occasion to recur to them hereafter in other diseases, in which, though their pathological import may be different, their mechanical or physical cause is the same.

The glairy transparent mucus, which is the first secretion poured out in acute bronchitis, marks, as we have said, the height of the inflammation; and it is important to watch the changes in the expectorated matter, as from it we may learn the probable progress of this disease: when this is favourable, the sputa lose their transparent character, become of an opaque white, without, however, losing their stringy mucous character (but, on the contrary, rather increasing in consistency than diminishing in adhesiveness); and subsequently they often acquire a greenish colour, showing that the inflammation is terminating in resolution. The difference in the sputa, at the different periods of bronchitis, was observed by the earliest writers in medicine, the glairy mucus first excreted having been by them denominated *crude*, and that in latter stages ripe, or concocted; indeed, before the introduction of auscultation, the character of the expectoration afforded one of the most important signs, not only of the progress of the inflammation, but also of the seat of the disease itself.

It may and often does happen, that after the sputa have passed into the concocted form, there is a recurrence of the crude, which indicates that there has been also a recurrence of the active inflammation; the appearance of the expectoration thus furnishing an important guide to our treatment. It may happen, too, that there is a partial recurrence or extension of the inflammation in one part, whilst the resolution is proceeding in others, in which case there will be a mixture of the two kinds of sputa, the opaque mucus generally floating in the thinner and more transparent fluid. When, however, there is no relapse of this kind, the fever subsides upon appearance of the concocted sputa, the tongue becomes cleaner from the edges towards the centre, the expectoration is looser, as it is commonly termed, that is to say, the sputa are excreted with less difficulty, the respiration becomes more tranquil, and the pulse returns to its natural standard.

Such is the progress of bronchitis when it terminates favourably; but as this is a disease not always unattended with danger, it is very important to have right notions of the modes in which it may prove fatal, in order that we may be enabled to counteract the fatal tendency, in each particular case. Now, in all inflammations we may have—1, Death from the direct effect of the inflammation, the excitement terminating in exhaustion or failure of the moving powers of the circulation, ending in death by *syncope*, or death from the heart; or we may have death from exhaustion produced by the excessive secretion, puriform or otherwise, consequent upon the inflammation. The former of these is in bronchitis a possible rather than a probable occurrence; the second occurs more commonly when the disease has degenerated into a chronic form, and seldom occurs except in those who have suffered from previous attacks of the acute. 2. Inflammation of a part, the performance of whose functions are necessary to life, may prove fatal by its arresting the functions of that part, either directly or by means of the products of the inflammation. This is the most common mode in which bronchitis destroys life, leading to death by *apnœa*.

It sometimes occurs where the inflammation is very intense and very extensive, that the swelling of the bronchial membrane which occurs at its commencement, is sufficient to arrest the access of air to the minute vessels ramifying in the cells of the lungs, and thus speedily cause death by apnœa, before any secretion has been poured out into the tubes. Instances of this are not common, and when they do occur it is most often in those who have suffered from repeated previous attacks, and in whom the bronchial membrane is consequently not in a healthy state, and who are never perfectly free from dyspnœa, or in those whose lungs are studded with miliary tubercles, and in whom a severe and extensive bronchitis has been suddenly set up by exposure to some of its exciting causes. Where this has been the case, the dyspnœa becomes rapidly more and more urgent, tongue, lips, countenance, and hands, especially under the nails, livid, the patient restless, anxious, and gasping for breath, the pulse very feeble, though the heart's action may be strong and heaving—all which circumstances show great obstruction to the transit of blood through the lungs; wandering delirium often supervenes, from the carbonized blood circulating through the brain, and the patient dies suffocated, the right side of heart, lungs, liver, and venous system generally, being gorged with blood. These cases, we repeat, are not very common, but they do happen, and it is necessary to be acquainted with them, and to understand them, as they present one illustration of death from apnœa, or death from the lungs.

The general mode, however, of the fatal termination of bronchitis, is by obstruction to the respiration, and consequent death from apnœa, caused by the inflammatory effusion in the tubes preventing the access of air to the pulmonary cells. This may take place at any period of the disease, and arises either from the intensity of the inflammation and its rapid extension to the minuter tubes, causing a profuse secretion to be poured into them more quickly than it can be excreted; or from inability of excretion, arising partly from its quantity and partly from the failure of the powers of life; in which latter case the cause of death is more complex, as the fatal result is brought about partly by failure of the moving powers of the blood, and partly by apnœa.

When there is danger of the disease terminating fatally by excessive secretion in its earlier stage, the dyspnœa, the lividity, and in fact the general symptoms presented by the patient, are the same as in the case of threatened apnœa from turgescence of the lining membrane of the tubes, with the exception, perhaps, that in the latter there is more heat and less moisture of the skin: the true distinctive characters, however, are to be found in the signs furnished by auscultation. In the dry condition of the membrane there is, as we have seen, sibilus, but no rattle; in the present instance, on the contrary, there are rattles to be heard over the whole surface of the chest, and the more extensive these are, and "the smaller" they appear, the greater is the danger.

It is, however, in the latter stage of the disease, where the powers of the constitution are naturally feeble, or where they have been exhausted by former diseases, especially by previous attacks of bronchitis, or by injudicious treatment at the commencement, that the greatest number of cases prove fatal, and that from the combined agency of exhaustion and excessive secretion; constituting the suffocative catarrh of the French authors, more properly termed suffocative bronchitis. The tendency to this mode of fatal termination, is a circumstance which it is extremely important to keep constantly in view in severe cases of bronchitis. The signs which threaten this result are, increase of the dyspnœa, generally with a concomitant increase of the lividity; a failure of the circulation evinced by the pulse becoming very soft, irregular, and sometimes intermittent; coldness of the extremities, with delirium or stupor. Auscultation discovers large and small rattles over the whole of the chest, with more or less wheezing; the resonance of the chest, upon percussion, remaining unaltered. Such is the ordinary progress of acute bronchitis, either to recovery or a fatal termination; it very frequently, however, runs on to the chronic form, which requires a separate notice.

The diagnosis of bronchitis, which is a matter of some practical importance, has become comparatively easy, since the general adoption of auscultation. From inflammation of the substance of the lung it may be distinguished by the *moist* rattles which we have already described; by the resonance upon percussion remaining unaltered, and by the absence of those auscultatory signs which will be presently pointed out as indicative of pneumonia; by the expectoration being more decidedly mucous, and not tinged by blood intimately mixed with it, as in the latter disease; and by the general symptoms of a less heat of skin and a softer pulse. From pleurisy it may also be distinguished, by the absence of the stitch, and the difference between the stethoscopic sounds. It is true, indeed, that we may have either of these last-named diseases concurring with bronchitis; in which case they may be distinguished by their characteristic symptoms, a diagnosis which certainly requires some tact and experience in auscultation; though it may be observed, that there is not often much danger of overlooking the bronchitis under such circumstances, since its peculiar sounds are more likely to mask, than to be masked by, those of the other diseases. Perhaps the most difficult point in the diagnosis of bronchitis is the distinction between the primary idiopathic form of the disease, and that which occurs as a complication or concomitant of continued fever; it is, however, a difficulty that may readily be avoided by those who are familiar with the latter disease, and the error is perhaps to be the most carefully shunned, by those who are prone to rely too exclusively upon the local signs furnished by auscultation. There is, again, often a difficulty as to bronchitis and phthisis, but this, also, is a question belonging rather to the diagnosis of the latter disease, and the same may be said of its occurrence with diseases of the heart or large vessels. The truth is, that though bronchitis occurs as a primary disease, and a formidable one, too, it often is also a symptom only, or a consequence, of some other lesion; so that the presence of its local signs, particularly when unattended with the fever that belongs to it, in its acute form, ought never to satisfy us that we have ascertained the whole extent of the disorder.

The causes of bronchitis, like those of most other diseases, have been divided into predisposing and exciting: in the more correct language which we propose to adopt, they may be classed as—1, conditions which induce a susceptibility to the disease, or an inability to withstand its direct causes: and 2, the direct causes themselves.

Now as to the predisposing conditions: there is no age which is exempt from its attacks, although the very old and the very young suffer the most severely from it; it affects alike, *cæteris paribus*, males and females. As regards habits of life, those are the least liable to its attacks who live temperately, and expose themselves moderately and cautiously to the tonic effects of cold; whilst, on the other hand, those who are enervated either by intemperance or other excesses, or who live in confined dwellings, or pass their time in overheated rooms, or inhale the carbonized air of crowded assemblies, or are employed in heated work-rooms, where the atmosphere is often vitiated, are most susceptible. Amongst the predisposing conditions, too, must be reckoned, previous attacks of the disease, and also diseases of the kidneys and the heart, if, indeed, the two latter are not to be reckoned amongst the direct causes.

The direct cause of bronchitis is commonly exposure to cold, or still more to cold and damp combined; especially after having been subjected to the influence of those conditions which have been pointed out as weakening the power of resisting the impression of such agencies. In infants, the disease is often excited by the process of dentition. The inhalation of irritating gases or of minute particles of dust, sand, or filings suspended in the air, also produces the disease amongst the different classes of artisans who are exposed to them in their respective occupations. As has been already observed, bronchitis accompanies several other diseases, as measles, continued fever, phthisis, pneumonia, disease of the heart and of the kidneys, &c., either as a consequence, an accidental complication, or a cause. It is also a very frequent accompaniment of that extensive epidemic the influenza; so much so, that many, or rather most, authors have regarded that disease as an epidemic bronchitis; the experience, however, of late years, has taught us that bronchitis is not essential to influenza.

Notwithstanding the apparently trivial nature of bronchitis in many instances, it is, nevertheless, one of the most fatal, as well as most frequent diseases in this, and perhaps in all variable climates. Our prognosis, therefore, ought to be very guarded in all severe cases, and in many it must be exceedingly doubtful, if not unfavourable. The circumstances which influence the amount of danger, are—the age and constitution of the patient—the attack being a first one, or a repetition of a disease from which the patient has frequently suffered before — the extent and severity of the attack—the season of the year, and perhaps also the locality.

When the disease attacks infants and young children, it is frequently very little amenable to remedies, and is fatal in great numbers of instances, greater than is perhaps commonly believed; since by far too many of such cases are set down as pneumonia, or inflammation of the lungs. In old people, again, there is a great susceptibility of the disease, which though inflammatory in the first instance, is very little amenable to such means as it would be safe to employ; and in the more advanced stage, there is a tendency to sinking, the danger of which is aggravated by the debility of age. Independently, however, of the age of the patient, the cachectic state of body induced by intemperance, or organic disease of any kind, greatly lessens the probability of recovery. This is especially applicable to disease of the heart and kidneys, the former of which, by impeding the return of the blood from the lungs, is an additional cause of that obstruction to the pulmonic circulation which is so dangerous in bronchitis; and disease of the latter organs, which is at all times apt to induce rapid effusion into the areolar tissue, is still more apt to do so in any part which is the seat of inflammation; and consequently when bronchitis attacks such subjects there is danger of a sudden and rapid anasarca of the submucous areolar tissue, threatening death from apnœa. Of all previous diseases, however, that which most increases the risk of an unfavourable termination, is a succession of previous attacks of the same disease, or a pre-existing chronic bronchitis, especially if it have been of long duration. Bronchitis is also more dangerous in the winter and spring than at other seasons of the year, especially if there have been cold and damp weather.

Independently, however, of all these considerations, a severe attack of bronchitis, affecting extensively the minuter tubes (the capillary bronchitis of some authors), is at all times to be dreaded. When, with much febrile excitement, rapid, hurried, and distressed breathing, and quick and sharp pulse, there are small sibilant sounds, or small rattles, over the whole of the chest, there is always reason for apprehension, which is increased by lividity of the lips or fingers. When, however, although the case be severe, the expectoration becomes more free and is performed without pain, and the sputa gradually change from the crude and transparent to the bland, opaque, and whitish or greenish, there is reason to hope that resolution is taking place; and still more, if at the same time the tongue begins to clean from the edges towards the centre, and the pulse and respiration become less hurried. On the other hand, a recurrence of the transparent sputa is a sign of a fresh attack, or extension of the inflammation, and is of course, as far as it goes, an unfavourable sign. The sudden suppression of the expectoration, again, especially if it be attended by increased dyspnœa, or lividity, or low delirium, portends the most urgent danger. Delirium is in itself at all times a dangerous symptom, especially in old persons and in those who have been previously subject to the same disease.

There are few diseases in which the pulse requires more careful watching than in bronchitis. It is from the commencement generally more compressible than in inflammation either of the lungs or pleura; but when the dyspnœa becomes urgent, and there is much lividity, it often becomes exceedingly small, although the impulse of the heart may remain powerful; this indicates great obstruction to the passage of the blood from the right to the left side of the heart, and, therefore, urgent danger; sometimes, too, under these circumstances, it becomes intermittent, though at others, owing to the difficulty of propelling the carbonized blood through the extreme circulation, the pulse is throbbing and even large, though very soft, with a feeling as if of a back stroke. A very scanty secretion of urine is also, if it continue obstinately, and independently of profuse perspiration, an unfavourable symptom, as it shows sufficient obstruction to the pulmonic circulation to cause engorgement of the liver, and thus, upon principles already explained (p. 27), to diminish the secretion from the kidneys.

From what has been said of the nature and danger of bronchitis, it will be at once apparent that the indications of treatment are seemingly opposite and inconsistent, but to an experienced and rational practitioner by no means incompatible: they are—to subdue inflammatory action, without exhausting the patient's strength—to facilitate expectoration, without stimulating the bronchial membrane—to allay irritation, without oppressing the brain by anodynes—and subsequently to support the strength of the patient, without rekindling the inflammation; to which may be added, the relieving the lungs by keeping up a free action of the other excreting organs.

The first and most obvious means of reducing the inflammatory action is the abstraction of blood, but in the use of this, we must be restrained by the risk of exhausting the strength of the patient, and therefore it must be practised with the greatest caution. In young and strong subjects, in the country, blood may sometimes be drawn with advantage in the commencement of the disease, particularly before the dry sibilus has been superseded by the moist rattle; but as a general rule in large towns and in elderly persons, or those of infirm constitutions, general bleeding ought not to be attempted. When, however, the above conditions being in its favour—the pulse having some degree of firmness, the skin being dry and hot, the dry sibilus not having yet given place to the moist rattle, or the secretion, if any, being still of the glairy transparent character—there is much febrile action and dyspnœa, with evidence upon auscultation of the smaller tubes being involved to a great extent, and the urgency of the case is such as to render it important to make a speedy impression upon the system, venesection may be performed. For this purpose the patient may be raised into a sitting posture, and the blood allowed to flow from a pretty large orifice until signs of fainting show themselves; provided, as a general rule, that not more than a pint be taken. The blood when drawn under these circumstances, will be buffed and somewhat cupped.

In most cases, however, it will be more prudent to have recourse to local, in preference to general, bleeding, and in adults, the best mode is by cupping, which has the double advantage of reducing the vascular excitement, and acting as a revulsive : in nervous females and children, when depletion is necessary, leeches may be employed. It is not, however, to be supposed, that in the majority of cases, even of considerable severity, depletion in any form is necessary; and in large towns, where the loss of blood is so generally, though not perhaps immediately, followed by exhaustion, we should not practise it, unless the indications in its favour are decided.

Emetics at the commencement of an attack of bronchitis often prove of excellent service : as already explained, they have a tendency to relieve that state of active congestion of the vessels of the mucous membranes which exists in a marked degree in the first stage of this disease; they should therefore be exhibited before the moist sounds begin to prevail : they are especially useful in the bronchitis of infants. The best form for administering them is, for adults, the combination of antimony and ipecacuanha (F. 16, p. 169), and for infants and young children the safest is the ipecacuanha alone, a few grains of which may be given in some watery vehicle. The bowels should next be well cleared by a mercurial purgative, such as calomel and rhubarb, or calomel and jalap.

The next remedies which require consideration, with a view to subduing inflammatory action, are antimony and mercury. The former of these, where it is not contraindicated by irritability of the stomach or bowels, is a remedy of which we have already spoken as exerting a special power over inflammations of mucous membranes, and is on this account particularly applicable in bronchitis; indeed, in the generality of cases of simple acute bronchitis it may form the staple of our treatment. Mercury has been much recommended by several writers of high authority; and as an adjuvant to other remedies, and in cases of great severity, in which it is necessary to use every means of subduing the inflammation, it may be used with some freedom; but as a general rule it ought only to be a secondary remedy, and we must not rely for fulfilling the primary indication upon the inducing of ptyalism; since, in cases of capillary bronchitis, which are the most urgent and dangerous, we can never feel confident that the disease has not a tuberculous origin, and in such cases, the use of mercury, in any considerable quantity, would tend to aggravate the mischief. The best practice will in general be found to be, to give the antimony in solution combined with an anodyne and diaphoretic (as in the mixture F. 17, p. 170); the antimony may, however, be increased or diminished according to the circumstances of the case. In general the first dose of the antimony may be about half a drachm of the wine of the potassio-tartrate, or one-eighth of a grain of the salt itself, to be repeated every four hours in solution: this may be gradually raised, when necessary, to half a grain of the latter, or two drachms of the former, beyond which it will seldom be necessary to increase the dose: where it is thought expedient, however, to push the drug still further, it may be well to lessen the intervals between its being taken, as from four to three hours. It must, however, be regulated by its effects upon the disease and upon the system generally, rather than by weight and measure. The dose should be increased to such an extent as to keep up a slight nausea, and so maintained till the skin is moist and cool, and the pulse softer and less frequent. In conjunction, or in combination, with the antimony, mercury in some form may be given in moderate doses: in the more severe cases the combination of calomel, antimony, and opium (F. 3, p. 108), may be given two or three times a day, the mixture being continued at the same time. In general, however, and particularly where the pulse is small as well as quick, a combination of Dover's powder and the mercury with chalk is to be preferred.

When the skin is less dry and hot, and there are moist rattles of various sizes to be heard over the surface of the chest, the antimony may be diminished or discontinued, and ipecacuanha employed as the safest and least irritating of expectorants. For this purpose ipecacuanha wine may be added to the mixture instead of the antimonial, and at the same time about five grains of Pil. Conii co. of the Pharmacopœia administered two or three times a day, or the mixture

(24)* may be employed, and the pill of Dover's powder and mercury with chalk exhibited night and morning. Another admirable expectorant is the inhalation of the steam of warm water.

This is the period of bronchitis at which counter-irritation may be most advantageously employed, or at least commenced; as before the skin has become soft and moist, and the pulse less sharp, it only aggravates the disease, as has been already explained in speaking of the treatment of inflammation in general (p. 111). It is, however, necessary here to insist again upon this point of practice, there being no disease in which blisters are so much abused as in bronchitis, and there is no popular error more pernicious than the very prevalent one that in a "cold upon the chest" a blister is a very safe remedy. The best mode of counter-irritation is generally the common blister, which may be applied over the chest, and allowed to remain on from twelve to sixteen hours or more in the case of adults; in children under a year old a good plan is to apply the blister for an hour, and then remove it for an hour, and if there be no vesication at the end of the second hour, to replace it; for the inflammation of the skin having been excited, it will very often go on to vesication, that is, effusion of serum, after the irritating cause has been withdrawn; when there is urgent dyspnœa, and we are anxious to produce counter-irritation as speedily as possible, a mustard poultice to the chest, or between the shoulders, is to be preferred to a blister, or the acetum lyttæ may be painted on the chest. A mustard poultice is, we believe, a safe remedy even at the commencement of bronchitis.

It commonly happens in a sound subject, not too much advanced in life, that bronchitis thus treated terminates favourably, and little further treatment is required beyond, perhaps, the application of an additional blister, and the continuous use of the anodyne and expectorant draught, the vessels of the mucous lining of the bronchia returning to their natural condition without any tonic or stimulating measures beyond a gradual return to the patient's usual diet. It may occur, however, either from neglect at the commencement of this disease, or from the loss of contractility in the capillaries, arising from previous attacks of inflammation, or from visceral disease, or a constitution impaired by time or excesses, that although there may be no very alarming symptoms, yet there appears to be little attempt at a return to the natural condition of the membrane; as shown by the continuance of the dyspnœa, the wheezing, or the moist rattles; just as we often see the vessels of the conjunctiva remain injected after inflammation of that membrane: in this state of things, some rather more stimulating expectorants will be of service. If the pulse be soft, the tongue moist, and the skin perspirable, and there are mucous rattles in the chest, but no great amount of expectoration, the ammoniacum may be given with advantage, in combination with about twenty minims of tincture, or about a drachm of the oxymel, of squills, with the addition, where the urine is scanty, of about half a drachm of sp. æth. nit.; and a repetition of the blister will, at the same time, be advisable. When there appears to be little secretion from the tubes, as shown by the diminished rattles but increased sibilus, especially if the urine be loaded or high coloured, and the dejections deficient in bile, the pill (25)[*] may be used. It may happen, however, that as the activity of the inflammation subsides, a still more alarming condition ensues, the patient becoming nearly prostrate, the pulse feeble, and the signs of sinking already described presenting themselves. In this state stimulating expectorants, as well as general stimulants, must be freely administered. The best medicine under these circumstances is the combination of ether, ammonia, and senega (26)[†]; but a most important adjunct, if not the most essential part of the treatment is the liberal but regulated use of wine or brandy; the former is generally to be preferred, and, in those who have been accustomed to its use, should be allowed to the extent of about four ounces a day, as soon as the signs of exhaustion begin to show themselves, and it may be gradually increased to eight, twelve, or more, according to the condition of the patient. When these measures become necessary, the situation of the patient is in the highest degree perilous, and the prognosis very unfavourable; still, by their persevering application many such cases may be saved.

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* (24) ℞ Ext. Conii, gr. xv.—xx.
Ext. Glycyrhiz. gr. xxiv.
Sodæ Sesquicarb. ℈ j.
Sp. Pimentæ, ʒ i.
Vin. Ipecac. ♏ xl.—ʒ j.
Sp. Æth. nit. ʒ i.—ʒ ij.
Aq. destillat. q. s.
Ft. Mist. ℥ iv. de quâ sumat part 4^{tam} 6^{tâ} quâq. horâ.

The difficult question to decide at this stage of the disease is the expediency of an opiate: the restlessness, which arises in great measure from the incessant cough, is often most distressing, and tends greatly to wear out the strength of the patient. To procure sleep, then, is highly desirable; but, on the other hand, we know that there is generally imperfect decarbonization of the blood, and, therefore, with one narcotic poison in the system, we must be cautious about introducing another. The suppression of the expectoration too, if it take place very suddenly or completely, is attended with danger, and often has a tendency to increase the oppression of the brain: great care is therefore to be used in the exhibition of opium in bronchitis attended with much dyspnœa, and as a general rule it ought never to be used when the countenance is dusky or the lips livid; but when the cheeks remain florid and there is a free expectoration, opiate, given at bed-time in combination with an expectorant, often acts most magically (27).*

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[*] (25) ℞ Pil. Hydr. gr. ss.
Pulv. Ipecac.
Pulv. Scillæ, āā gr. i.
Ext. Conii, gr. ij.
Ft. Pil. ter die sumend.

[†] (26) ℞ Ammon. Sesquicarb. gr. v.
Sp. Æth. co.
Tinct. Scillæ.
Tinct. Hyoscy. āā ♏ xx.
Decoct. Senegæ ℥ vii. Misce.
Ft. Haust. 4tam quaq. horâ sumend.

About two or three drachms of the Liq. Ammon. Acet. may be added when the skin is dry.

The treatment of bronchitis has been described at some length, not that it is possible, by the most detailed plan, to include that which shall be applicable to every particular case of this varying disease, but because it is of the greatest importance to understand the different indications, and the principles upon which they are to be fulfilled; for the very frequency of the disease is too apt to induce a routine practice, and therefore one in which little regard is paid to the distinction between the different phases, which require such different and even opposite remedies.

It has already been remarked. that after an attack of acute bronchitis there may be little or no attempt at a return of the bronchial membrane to its natural condition, its vessels remaining injected, apparently from a want of contractility, the part being, in fact, in a state of asthenic hyperæmia, or passive congestion, the blood circulating very slowly in the capillaries.

The immediate effects of this condition of the bronchial membrane will be turgescence, probably œdema of the submucous areolar tissue, and altered secretion, the latter being generally increased; the necessary symptoms of which will be dyspnœa, cough, and sometimes expectoration. This state of things may, however, come on to all appearance spontaneously, and without any previous acute disease; in either case it is termed *chronic bronchitis*.

The above constitute what may be termed the essential and necessary conditions of chronic bronchitis, but others are often superadded to them, or rather follow as their consequences, which are the causes of the distress and danger often attendant upon the disease.

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* (27) ℞ Opii, gr. i.
Antim. Pot. tart. gr. $\frac{1}{4}$
Confect. Ros. q. s. ut Ft. pil. horâ somni sumend.

Or, ℞ Morphiæ Hydrochlor. gr. $\frac{1}{3}$.
Pil. Scillæ co. gr. iv. Misce.
Ft. Pil. horâ somni sumend.

The continued hyperæmia of the mucous membrane may lead to permanent thickening, from the effusion of fibrinous matter into the areolar tissue; this will at once impede the respiration, and interfere with the aëration of the blood; hence there may arise increased dyspnœa, wheezing, and lividity: or, again, the puriform secretion from the mucous surface may be so excessive as not only to give rise to cough and dyspnœa, but also, by the continual drain upon the system, to lead to pallor, hectic, and emaciation.

We perceive from this, that when the above structural changes have supervened upon chronic bronchitis—and they are such as that disease is continually tending to induce—the affection assumes a highly dangerous character, and a fatal termination may be apprehended in one of two modes.

1. Where there is dyspnœa and wheezing, from the walls of the tubes being thickened, and their calibre diminished, the tendency to death is by apnœa.

2. When, on the other hand, there is excessive puriform secretion, death from gradual sinking—death, that is to say, from asthenia, is to be dreaded.

The cases of these two different classes, though consequences of the same disease, present remarkable contrasts: in the former, where there is obstruction to the functions of the bronchial tubes by change in their structure, the chief auscultatory sign is wheezing; in the latter, where the chief mischief is the great muco-puriform secretion, there are rattles: in the former there is great lividity, the countenance will be often dusky, and the lips and ends of the fingers blue; in the latter there is indeed a slight livor of the lips, though it requires a practised eye to recognize it, but otherwise there is pallor: in the former there is a bloated countenance, and sometimes general œdema; in the latter there is emaciation. In the former the patient dies suffocated; in the latter, exhausted.

These are the two simple forms of chronic bronchitis, though neither is often presented to our notice uncomplicated by the other, and it is perhaps from their joint effect that another change takes place in the bronchial tubes, of great importance in connection with the subject of chronic bronchitis. It appears to be a law in pathology, that when a membrane overlying muscular fibre is inflamed, the latter loses in some measure its contractility; and the proposition may perhaps be extended to include fibrous tissues generally: if the inflamed membrane be a mucous one, the contractility of the muscular fibre is at first increased, and subsequently diminished; as we see in the diarrhœa and subsequent constipation which occurs in inflammation of the mucous membrane of the intestines. Now, according to this, not only should we expect at first some increase in the action of the non-striated muscular fibres of the bronchial tubes, which it is by no means improbable does actually take place, aggravating the dyspnœa, and aiding the swelling of the membrane in producing the sibilus; but also that there would subsequently be a diminished power of expelling any accumulated secretion, and also a tendency to dilate, or become enlarged, under the slightest increased distending force; such a force is often supplied by this very secretion, as well as, in the opinion of some, by the convulsive efforts of coughing. Accordingly, we do find every variety of dilatation of the bronchial tubes; sometimes a single pouch like an aneurism in an artery; sometimes a series of dilatations in the same tube; sometimes a uniform cylindrical dilatation affecting a congeries of tubes, branches of an entire bronchial tree. The section of a cluster of tubes of this kind may be compared to the fingers of a glove.*

Before quitting this subject we would remark, that though we have sometimes the accumulated secretion as the cause of this dilatation, and the changed condition of the walls of the bronchial tubes as the reason of their susceptibility of the change, we would not limit the mechanical cause to the former; indeed, it is not improbable that where the contractility of the walls has been destroyed by inflammation, the atmospheric pressure in inspiration will be a sufficient cause; and besides this, as we shall hereafter see, the instances of greatest dilatation do not generally occur in cases of simple bronchitis, but in those which are complicated with pneumonia, or pleurisy, or both, where the subsequent changes in the surrounding textures have often a considerable influence in promoting the dilatation of the tubes.

When dilated tubes are added to the other changes produced by chronic bronchitis, there will of course be considerable aggravation of the dyspnœa, and the lividity consequent upon the obstructed function of the lungs. If the dilatation is in the small tubes there will be sibilus and wheezing, with deficiency of respiratory murmur; the presence or absence of rattles depending upon the amount of secretion; if in the larger, there will be ronchus, with or without large rattles. It may be remarked, however, that there seems to be scarcely any limit to which the tubes, especially those of the third or fourth dimensions, may dilate; so that they often present the physical signs of cavities produced in the lungs in other ways.

The dilatation of the tubes by the pressure which it produces upon the surrounding lung-tissue, produces a form of appearances differing in some respects from that of which we have already spoken: since, though it is commonly of no very great extent, it is not necessarily lobular, or restricted to the portion of lung supplied by any particular tube, neither does it commonly affect the whole portion of lung supplied by one of the larger ramifications of the tubes. It may, however, happen, that when a congeries of tubes becomes dilated as described above, all the intermediate lung-tissue is in a state of carnification, as it is termed, and thus, in other words, there is apneumatosis of nearly the whole of a lobe, or even more.

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* See a good representation in Drs. Handfield Jones and Sieveking's 'Pathological Anatomy,' p. 403.

The expectoration in chronic bronchitis may, as we have observed, be very scanty, and sometimes transparent: often it is abundant, and of a muco-puriform character; but where there is the latter associated with dilatation of the tubes, the puriform mucus, from remaining sometimes in these pouches, is coughed up in roundish lumps, looking, when seen floating in a fluid, like coins, and thence called nummular sputa.

We have already pointed out the different modes of fatal termination in chronic bronchitis, and the different symptoms which characterize the tendency to one or the other; still the two forms of the disease may exist in the same subject, and in the worst cases they commonly do so. In such there will be wheezing, ronchus, and rattles; there will be lividity of the tongue, lips, and fingers, with pallor of the surface generally; there will be emaciation, but with a bloated, and often œdematous condition of the face and extremities; in these cases, too, we often have the hands emaciated, but the tips of the fingers swollen from the long continuance of venous congestion, and the nails livid and curved; there is orthopnœa; the skin is sometimes dry and harsh, at others, especially over the extremities, bedewed with a clammy perspiration. The signs of obstructed pulmonic circulation being added to those of exhaustion from excessive secretion, we have palpitations from dilated right ventricle, defective secretion of bile from gorged liver, and scanty urine.

It must be apparent, from what has been said, that chronic bronchitis is a disease continually tending to a fatal termination, and that even when it is present in its simplest and mildest form, there is danger of those additional lesions which bring about this result. Whilst there are dyspnœa, cough, and expectoration, there is occasion for the greatest caution. When there are orthopnœa, wheezing, and lividity, puriform expectoration, hectic, and emaciation, there are grounds for the most serious apprehensions.

The urgency of the disease is liable to great variations; many persons are affected by it only in the winter, and are nearly if not entirely free from it in the summer months: this form of the complaint being popularly known as winter cough; but after some years it generally happens that the disease does not altogether cease, but merely becomes less severe, in summer, whilst the winter attacks become longer and more violent. The persistence of the symptoms during the summer is a sign that structural changes are going on, or, in other words, that the disease is proceeding, though it may be but slowly, to a fatal termination.

The treatment of chronic bronchitis must be partly preventive, and partly directed to meet the more urgent symptoms as they arise. When a person has been the subject of winter cough, the great object should be, if possible, to take advantage of the summer intermission, or even remission, if it be no more, to correct the morbid habit or tendency, so to speak, of the bronchial membrane. Now as this appears to consist mainly in a state of passive congestion of that membrane, to which there is often added deficient tonicity of the tubes, the best means for correcting it will be a moderately-tonic treatment, and mode of living. Of these a pure and moderately-bracing atmosphere is a most essential part. Generally the sea will be found to agree well with such patients during the summer; and that often in situations where it might be supposed to be too keen, as on the eastern coast, for instance, at Margate or Ramsgate, or even at Lowestoft or Cromer. It is generally, however, for those in whom there is considerable expectoration, that such situations will be found best suited; for those in whom there is wheezing, with little or no expectoration, the rather more relaxing atmosphere of the coasts of Devonshire and Cornwall is to be preferred. If the patient be ordinarily resident in a large town, he will often derive much benefit from a pure, and moderately-bracing inland air. The diet should be nutritious: about two glasses of port wine, if it agree with the patient's stomach, should be recommended where there is much secretion. At this period, too, tonic medicines may be of service: in cases of profuse expectoration, the sulphate of iron is often very useful. What perhaps is a still better remedy is the sulphate of zinc, which will be at once a moderate astringent and a tonic. This, with a little conium, will be very applicable to the more common class of cases, in which though there is some cough and expectoration, the latter is not excessive (28).* When slight attacks of an acute or sub-acute character supervene during the summer, they must be treated as ordinary bronchitis. In those in whom the disease has not been confirmed, the attempt may be made during the summer to inure the patient to the use of cold, in the form of bath, sponging, or affusion, as recommended against catarrh.

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* (28) ℞ Zinci Sulphat. gr. j.
Ext. Conii, gr. iv. Misce.
Ft. Pil. bis vel ter die sumend.

Having taken precautions in the summer to brace the patient against the attack which is to be expected in the winter, equal precaution must be used to mitigate it when the first symptoms begin to show themselves. This, however, is not to be done by too soon confining the patient to the house, as in general he should be encouraged to go out in fine weather to the last, carefully avoiding night or evening air. The clothing should be uniformly warm; light woollen being worn next the skin, but heavy clothing avoided.

In severe and threatening cases, the patient should be confined to the house in the winter, and if there be much cough, and it appear easily excited by the admission of cool air, he should even be kept in apartments, the temperature of which should not be allowed to fall below 60°; and when, as they often will do, acute attacks supervene, they must be treated upon the principles already recommended for acute bronchitis, it being always borne in mind that in such cases there is an earlier tendency to sinking, and therefore that support and even stimulants must not be long withheld.

We have before (p. 210) alluded to the possibility of a portion of tough mucus suddenly obstructing a bronchial tube of greater or less size, and have pointed out the auscultatory signs by which such an accident may be conjectured. Now as this is most likely to happen by such a portion of mucus being drawn in, as it were, in the act of inspiration, it may happen that the portion of lung to which the tube so obstructed was conveying the air is not inflated and becomes collapsed; the surrounding and inflated portion of lung pressing upon it and reducing it to a state not unlike that of the lung of a fœtus which has never respired. This state of things has been described by the term *apneumatosis*, or collapse of lung. It has also received the name atalectasis, or non-expansion, a word, however, which has been mostly used to express the condition of a portion of lung which has remained, as it were, in the fœtal state, owing to its never having been inflated. This is a subject that requires a much more comprehensive consideration than the mere casual obstruction of a bronchial tube, involving, as it does, lesion of the whole respiratory apparatus and also of the heart. But, as at present, we are concerned only with its connection with bronchitis, we may observe, that when it arises from sudden obstruction of a tube, it may be either lobular or diffused, according as the obstruction is of a large or a small one. The latter is, at least as a matter of clinical experience, the more common, and also the more dangerous. Andral mentions two fatal instances. It may at first sight appear strange that the sudden obstruction of respiration in a part, however large, of one lung, should prove thus dangerous to life, when we know that persons have lived for years, even, with the total obliteration of one lung, and that too, in some cases, when the other has been in a great part irrespirable ; but we must bear in mind that in the examples before us the obstruction is sudden, and therefore, that the circulation and respiration have had no time to adapt themselves to the changed condition, but also that in cases of extensive and severe bronchitis, the respiration is already carried on with much difficulty through the whole of both lungs.

When we have good reason to suppose that such an accident has occurred, as suggested, by sudden and urgent dyspnœa arising suddenly in the course of a bronchitis, without any evidence of effusion, consolidation, or the escape of air into the pleural cavity, the best remedy is an emetic, exhibited in such a form as will not be likely to depress the action of the heart. For this purpose, 20 or 25 grains of sulphate of zinc may be administered, or 20 grains of ipecacuanha, in a draught, with half a drachm of aromatic spirit of ammonia.

XIII.

PNEUMONIA—PLEURITIS.

Pneumonia may be defined to be inflammation of the air-cells of the lungs, though this inflammation may give rise to different products, and consequently different results. It sometimes happens, indeed, that inflammation of the bronchial membrane extends to the air-cells, and so involves the substance of the lung, and more commonly the disease of the air-cells implicates the bronchial tubes; still we have many instances of its commencing in the former, and confining itself solely to them; and therefore it is desirable to consider it singly.

There has been a good deal of difference of opinion as to the exact seat of the inflammation—as to whether, in fact, it is in the wall of the cell comprising the vessels, or whether it is on the mere lining or internal surface of the cell; a right application, however, of the laws of inflammation, in connection with the structure of the part, will be sufficient to show that these different views are rather partial and defective, than involving any real error.

Now, we have seen that the first step in the process of inflammation is that of engorgement or active hyperæmia, and as the interstices between the cells consist almost entirely of plexus of minute vessels, the result must be a swelling of the walls of the cells, with a diminution of their cavities, giving to the lung apparently a closer texture, and one more largely supplied with blood—this is what is termed the stage of engorgement At this period of inflammation, however, the true inflammatory products have hardly made their appearance, and we have merely the tumescence resulting from the increased supply of blood. When a lung in this stage of inflammation is examined after death, it is found not to have lost its property of crepitating when squeezed between the fingers, although it does not collapse so readily under the pressure of the atmosphere as healthy lung; it is of a florid red colour, and the blood flows freely from it when it is cut into.

The next step in the process, if the inflammation do not subside by resolution, is the effusion of some of its characteristic products. Now, although in the case of the disease under consideration these products vary in their subsequent results, they in the first instance occur in the form of lymph, either fibrinous or corpuscular, or in the compound form in which the fibrine and corpuscles are mixed (pp. 45-47), the former, or the latter, preponderating, according to the greater or less constitutional power of the patient.

When there is active inflammation in a subject of tolerably good power, we have the greatest proportion of fibrine, which almost immediately assumes the solid form, giving rise to consolidation of the lung, which, owing to the large supply of blood, retains the red colour which it had acquired in the first stage of the inflammation. The highly-vascular inflamed lung, thus consolidated, resembles the liver in appearance, and is said to be "hepatized;" and its condition in this stage of the inflammation is called *red hepatization*, or the second stage of pneumonia. It should, however, here be remarked, that there is a difference of opinion amongst authors as to the exact situation in which this deposit takes place. Laennec and others were of opinion that it took place into the cells, filling them up, and, as it were, obliterating them; and certainly the finely-granulated structure, which the lung in this stage of inflammation commonly exhibits, when lacerated or cut into, seems to favour this supposition; and that this is really so, in some cases at least, of acute pneumonia, has been demonstrated by Reynaud. Others, again, amongst whom may be mentioned Andral and Stokes, have maintained that the red hepatization of acute pneumonia depends not on any deposits in the vesicles, but by the walls of these vesicles being so thickened or swollen by the excessive congestion of blood in their vessels, that their surfaces are approximated, and sometimes so closely, as to obliterate the cavities; and they further account for the red hepatization presenting in some cases a granular, and in others a smooth surface, by supposing the latter to arise from the more intense congestion and perfect obliteration of the cells; and it cannot be denied that the inference to be drawn from the examination of dried specimens of hepatized lung is, that in some cases this hepatization results from congestion and probably coagulation of blood *in the vessels*. This view of the matter overlooks, however, the true products of inflammation, and merely shows that the condition termed hepatization, or one closely resembling it, may be produced independently of them; it does not, however, invalidate the observation of Reynaud, of the actual presence of the inflammatory products in the air-cells; nor, on the other hand, do the latter observations prove that in all cases where plastic lymph is poured out, it is necessarily effused into the cells, and into the cells alone. Not that we recur to the old notion of an intestinal effusion, the fallacy of which was pointed out by Dr. Addison, who demonstrated its impossibility by showing that there was none in the cellular space into which lymph could be effused. But what is meant is, that while the lymph is effused upon the surface of the cell-wall, *i. e.*, into the cell, the exudation also takes place into the fibrous structure of the cell-wall, as is the case in inflammation of the peritoneum and other serous membranes.

It is not of great practical importance, and therefore not consistent with the object of the present work, to pursue this question further; we may, therefore, briefly state, as the result of these seemingly opposite observations, that engorgement of the lung, without plastic effusion, may exist to such an extent as to give rise to a condition apparently the same as that commonly described as red hepatization; but that this engorgement, if it do not terminate by resolution, is most frequently followed by the extra-vascular product of inflammation, *i. e.*, the effusion of inflammatory lymph; this taking place into the air-cells, and so filling them with plastic lymph, and giving the hepatized lung the granular appearance.

Such are the steps by which the lung is brought to the state of red hepatization. Here, however, it may be well to remark, that instead of the plastic form of effusion which we have described as producing this state, we may have the effusion of the compound or corpuscular lymph, or lymph in which there is a great excess of serum, constituting what may be termed serous pneumonia, or inflammatory œdema of the lung, a condition not generally recognized by authors, but of the existence and danger of which there can be no doubt: this state supervenes sometimes very suddenly upon the first stage of pneumonia, generally in persons of impaired constitutions and unsound viscera; at others, indeed, the previous stage may have been so short as almost to have escaped detection.

When a portion of lung has been brought to the state of granular hepatization, it may subsequently undergo various changes.

If resolution do not ensue, the effused lymph fills the air-cells, and the intervening vascular tissue loses its red blood, and becomes exsanguine. The whole structure thus becomes of a dirty white, or rather greyish appearance, from the admixture of the dark pulmonary pigment. This is *grey* hepatization, or the third stage of pneumonia. The inflammatory product now begins to soften, and this may occur in one of two ways, according as the case terminates favourably or unfavourably.

In the former case the albuminous matter softens, and is resorbed, and the lung returns through the first stage of engorgement to a state of health.

If, on the other hand, the disease terminate fatally, the softened albuminous matter assumes the form of pus, constituting what is termed purulent or puriform infiltration. This suppuration does not take the shape of an abscess, which is very rarely met with in the pulmonary tissue, excepting when the deposit is of a strumous or tuberculous character; or in the case of the lobular form of pneumonia seen in connection with puriform infection.

Sometimes the portion of lung which has been condensed or consolidated becomes harder and dryer, with a uniformly dark-grey colour from the admixture of the black pulmonary pigment, constituting the iron-grey induration.

We believe this to be, in many instances at least, the explanation of the iron-grey induration: it is given with much diffidence, since Dr. Wilks, whose opinion is entitled to great deference, regards it as the effect of an essentially different process, namely, chronic inflammation of the tissues of the lung, the induration consisting of fibrous tissue gluing the whole of the effective portion of lung into one hard mass, excepting where it is traversed by bronchial tubes, which are drawn out and enlarged by the contraction of the fibrous deposit, the process being gradual and continuous, and not preceded by any acute inflammatory stage. It is certainly a confirmation of this opinion that the most frequent seat of this chronic change is in the apex of the lung, whereas acute pneumonia most commonly affects the middle or lower lobes. It is, however, admitted by all that the chronic pneumonia *may* be a sequence of the acute.

Having now described the different changes produced in the lungs by pneumonia, we shall be better able to understand and appreciate the different symptoms by which they are characterized. It may be well to bear in mind that they are of a threefold character—1, those of the inflammatory fever resulting from the inflammation of a parenchymatous viscus; 2, the disturbance in the functions of the lungs themselves, as well as of other organs, resulting from the lesion of the former; 3. the changes in the auscultatory phenomena of the chest, resulting from the altered physical condition of the lungs.

Pneumonia in the first stage, and its active form, is attended by inflammatory fever of an active character: this fever commences with rigors and oppression, followed, in most cases, by strongly marked symptoms of febrile reaction,—giddiness,—

sometimes severe headache, with now and then delirium, especially towards night,—heat of skin, which is almost always of a pungent character,—a full and strong, though sometimes rather labouring, pulse; the tongue is furred and somewhat congested, urine scanty and rather high coloured; and there are thirst and loss of appetite, with an anxious expression and dusky hue of countenance.

With these symptoms of general fever are those arising from the disturbance of the particular organ; there is dyspnœa, or, to speak more strictly, hurried respiration, the painful and difficult respiration of bronchitis not being necessarily present, unless that disease be so likewise; there is not necessarily any pain in the chest, though this is often present, from the frequency of bronchitis of the small tubes; upon the same circumstance, too, depend the frequency of the cough, and the quantity and quality of the expectoration; so that when this complication is absent, all these symptoms may be wanting. Generally, however, in persons of tolerably sound constitution, and not very far advanced in life, there will be more or less inflammation of the smaller tubes in the part of the lung affected, and there will be pain, or rather a feeling of soreness in the chest, cough, and expectoration of a remarkably viscid mucus, which is of the consistence of thick mucilage, containing numerous minute air-bubbles, and adhering so firmly to the sides of the vessel containing it, that it may be inverted without its escaping. This matter may be of every possible colour, sometimes almost like white of egg, more frequently of a rust colour, and sometimes tinged with blood; but it is also not unfrequently of a bright gamboge yellow colour, or even bluish or greenish. It has been observed that in pneumonia the expectoration often contains a considerable quantity of chloride of sodium, and that there is a corresponding deficiency of this salt in the urine; in the stage of hepatization it is almost entirely absent from the latter secretion.

At this period of the disease we do not commonly have any very marked disturbance in the functions of other organs beyond what might be supposed to arise from the general febrile disturbance, with the exception of (1.) the heat of skin, which is hardly to be ascribed to the latter cause, since it is far more frequent than is observed in ordinary inflammatory fever, or indeed in any disease, with the exception of the early stage of continued fever in young subjects, and in the commencement of the exanthems, and in some cases of albuminous urine.* The relation, however, in which this state of skin stands to the disease in the lungs, has not yet been explained; whether it depends upon an increased evolution of carbonic acid, calling for an increased generation of it, and consequent increased evolution of heat in the extreme circulation; or whether the inflamed lung, excreting less than its usual quantity of this gas, there is less heat rendered latent by its evolution in the air-passages, has not been shown; the latter supposition is, however, more in accordance with the analogy of other organs. (2.) The derangement in the functions of the liver often giving rise to some degree of jaundice: this probably arises from engorgement of the hepatic cavæ, and consequently of the portal vessels, from the impediment to the pulmonic circulation: it is said, indeed, to belong more especially to pneumonia of the right side; and if this be true, it must be the result rather of contiguity than functional relationship.

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* This symptom was first pointed out in its true importance by Dr. Addison.

The local or auscultatory sign which characterizes this stage of the disease, is a dry crackling sound accompanying each act of respiration, but heard most distinctly at the termination of the inspiration. Various similitudes have been found for this sound: it has been compared to the noise produced by throwing salt upon red-hot coals; but it is best imitated, as observed by Dr. Williams, by the sound which any one makes by rubbing a lock of his own hair near the ear between his thumb and fingers. Several causes have been assigned for this phenomenon: some have supposed it to arise from the passage of the air through the viscid secretion in the cells, and the formation of very minute air-bubbles in them; others, with certainly not less probability, have ascribed it to the expanding of the cells, the walls of which have been rendered more stiff by the tumescence, and more adhesive by the small quantity of viscid secretion upon their surface. Be this as it may, it is certain, then, that this sound (which we shall denominate generally a crepitation, and distinguish particularly, as dry crepitation, or pneumonic crepitation) belongs especially to the state of lung which we have already spoken of under the name of engorgement, whether that engorgement be the commencement of inflammation; or whether it belong to a portion of lung that has been hepatized, and is in process of return to its natural condition.

It may here be observed that this introduces to us a fresh class of sounds, which we shall speak of generally by the name of crepitation, or crackling. We have already described the ronchus and sibilus, which are produced by air in cylinders without liquid, the râles or rattles which are produced by air and liquids in tubes; and we now have to do with crepitations, or crackling, which arise from the separation or unfolding of membranes which are either rendered more unyielding by congestion, or their surfaces more adherent by altered secretion. These crepitations may be dry or moist, hard or soft; in the present case we have a dry crepitation, which, when not masked by other sounds, cannot fail to be recognized when once it has been heard. It generally happens that this crepitation is associated with more or less of the sounds arising from bronchitis of the smaller tubes; these, however, do not in ordinary cases prevent our hearing the dry crepitation. It is important, however, to distinguish this crepitation from a fine bronchial rattle, and fine dry pleuritic friction sound, both of which will very closely simulate it.

Up to this time there is no diminution in the resonance of the chest on percussion, the cells not being sufficently closed to prevent their containing a considerable quantity of air. The signs, then, which belong *essentially* to the first stage of pneumonia are—inflammatory fever,—pungent heat of skin,—dry crepitation without loss of resonance on percussion: with these are commonly but not necessarily, associated pain in the chest, cough, and viscid expectoration.

In the second stage, or that of hepatization, there is for the most part a continuance of the fever; the heat of skin is not *necessarily* present, though it is generally so in practice, since when one part of this inflamed mass is in a state of consolidation, there is probably some other part in a state of engorgement, either advancing towards consolidation or retrograding from it. The disturbance of the functions of the lungs and other organs, moreover, becomes greater, there is more duskiness of the countenance, owing to the greater impediment to the aëration of the blood, the functions of the liver and kidneys are also more disturbed. The disease also sometimes proves fatal in this stage, and signs of failure of the powers of life may manifest themselves by the pulse becoming quicker and unequal, or the tongue brown and dry; or there may be threatened death from apnœa, evinced by hurried and laborious breathing, livid countenance, wandering delirium, very small pulse, and clammy sweats.

The signs furnished by auscultation are very different: the lung having now become consolidated, the air is excluded from the vesicles, and we have dulness on percussion, the sound of the air passing along the tubes becomes audible, and we hear tubular breathing, and, in the manner already explained (p. 164), bronchophony. The intensity with which these sounds may be heard must depend evidently upon the continuity of the consolidated portion, and upon its being near the surface; if the consolidation be confined to separate lobules, here and there, through the substance of the lungs (a rare occurrence) there may be neither tubular breathing nor bronchophony; or if there be a consolidated mass of some size towards the centre of the lung, distant tubular breathing may be heard without bronchophony, though the latter is scarcely ever audible without the former. In ordinary acute pneumonia, however, it almost always happens that the inflammation extends to the surface; thus we have in its second stage both tubular breathing and bronchophony. As, however, the consolidation of the lung renders audible the passage of the air along the bronchial tubes, which could not be heard independently of it, so in the same way it gives an increased distinctness to the bronchial rattles, which often become under these circumstances remarkably characteristic signs.

We have noticed, already, that lymph effused into the substance of the lung may be either of the fibrinous or corpuscular kind, and also that it may vary as regards the proportion between its different constituents. And there is good reason for believing that effusion of serum containing but a small proportion of fibrine or corpuscles, sometimes takes place suddenly into the cells, as a consequence of inflammatory engorgement of the lungs, and in the place, if we may be allowed the expression, of the plastic fibrinous lymph which constitutes hepatization. This is distinguishable from simple œdema or serous dropsy, by its being consequent upon engorgement, and preceded by the general symptoms of pneumonia: there are not, perhaps, any well-marked signs by which its approach may be anticipated, but it is most to be apprehended in those who are the subjects of any visceral disease, especially of the heart or kidneys, and in whom, from previous illness, or other circumstances, a deficiency in the fibrine and red corpuscles, or a want of constitutional power, may be apprehended. Its occurrence is generally attended by increased dyspnœa and lividity, often by orthopnœa—a feeble, quick, and sometimes intermittent pulse; by much the same symptoms, in short, as indicate suffocative bronchitis, from which it is to be distinguished by the previous history, and by the signs furnished by auscultation. Its stethoscopic signs are dulness on percussion, bronchophony, and tubular breathing, not, however, so well marked as in consolidation; and a moist or soft crepitation.

When the disease goes on favourably, and the cells of the affected portion of the lung become emptied of their adventitious contents without injury to the tissue of the organ, the respiration becomes less embarrassed, and the tongue more natural; the hectic subsides, the expectoration decreases, and has less the character of pus, and more that of mucus; the dulness, tubular breathing, and bronchophony, as well as the moist crepitation, gradually disappear, and are either succeeded by healthy respiratory murmur, or there is the recurrence of the dry crepitation (*râle crépitant redux*) before the healthy action of the lung is restored.

When consolidation has taken place, and the disease advances, the next step in the progress of the change in the lungs is, commonly, the grey hepatization: this may lead to a return to the natural state, or to the puriform infiltration. The general symptoms which attend puriform infiltration are principally those of diminished power, and activity in the fever; the latter of which assumes more of a remittent or hectic character; the pulse becomes soft and the skin generally cooler, though there are at times flushings of heat, and often profuse perspiration: the tongue is coated, red, and sometimes glazed, and the whole condition of the patient betokens a tendency to exhaustion. There is a frequent cough, with generally copious expectoration of a puriform character, commonly presenting the nummular appearance, though sometimes it looks like uniform pus: this expectoration has generally either a very offensive fœtid odour, or a peculiar earthy one. The stethoscopic signs are just what might be expected from the nature of the changes going on in the lung; namely, a moist crepitation, with dulness, tubular breathing, and bronchophony,—the three latter, however, being much less distinct than in consolidation.

It generally happens, under these circumstances, that the disease takes an opposite course, the tissue of the lung becoming disorganized, or the patient sinking, without such actual destruction, from the exhaustion attending the extensive suppuration: in this case the expectoration continues of the puriform character, sometimes becoming intolerably fœtid, or assuming a pinkish colour from the admixture of blood; the powers of the patient fail, the tongue becomes brown, and the pulse more feeble, the stethoscopic signs remaining little altered.

The passing of the lung into the state of iron-grey induration is not distinctly marked by any characteristic signs: when it takes place, the general symptoms of disease subside, but the resonance and respiratory murmurs are not restored at the part affected, and bronchophony or even pectoriloquy may remain: the latter is generally the result of induration of the lung, which is attended by contraction, taking place when the pneumonia has been complicated with pleuritis and bronchitis: this contraction of the lung, which has been rendered adherent to the ribs by the pleuritis, draws asunder and consequently dilates any large tube which may pass through it; at the same time that the occurrence of the bronchitis renders the tube more susceptible of such dilatation.

The symptoms, most commonly observed when the lung passes into a state of gangrene, are a greenish colour of the expectoration, which has a most intolerable fœtid odour, and at the same time a rapid failure of the powers of life in the patient; the fever assuming a low typhoid form.

Having already given the principal symptoms, both local and general, by which pneumonia is accompanied, we may confine our remarks upon the diagnosis of this disease to the means of distinguishing it from those with which it is most likely to be confounded: and here it may be observed that pneumonia in its most *ordinary* form is not pneumonia in its most *simple* form, and that the cough, expectoration, and pain in the chest which commonly accompany it, and which are generally the symptoms by which the attention of the practitioner is directed to the chest, but which, in reality, belong more to the capillary bronchitis, which accompanies the pneumonia, than to the pneumonia itself, are consequently absent when the disease appears in its most simple form; in which case it can only be detected by a careful exploration of the chest by auscultation. The important point, then, to be borne in mind is, that pneumonia may occur without those more obvious signs which are commonly received as indicative of its presence, and that we are not to be diverted from our examination of the chest by their absence.

The diseases for which pneumonia is most liable to be mistaken under these circumstances are continued fever and certain cerebral affections.—From fever it may be distinguished by the greater anxiety of the countenance, which, though congested, presents an appearance very different from the stupid apathy of the latter disease; and although the patient may be confused in intellect, and even delirious, yet the delirium is different from that of fever, and more resembles that which we have noticed as occurring in extensive bronchitis, the patient being capable of being roused, and rationally answering questions for a time, though soon becoming confused again. The tongue also presents an important difference, being covered with a whitish fur, unlike what is observed in the commencement of fever. A most important aid in this often difficult diagnosis is that furnished by the pungent heat of skin which we have already noticed as belonging to pneumonia, in its earlier stages. It ought not, indeed, to be affirmed that pneumonia is present in all cases in which this peculiar heat of skin is found, as it may occur, as we have before said, in some other diseases, but where it is present it ought always to direct the most careful attention to the condition of the lungs.

As regards the cerebral symptoms, pneumonia sometimes commences, especially in the young subject, with intense pain of the head, which is very likely, if there be no cough or pain in the chest, to divert our attention from the lungs to the brain. In old persons, again, the same error may arise from the disease commencing with active delirium, or a threatening of delirium tremens: in children, again, we may have no obvious symptoms of disease, but such as seem to belong rather to hydrocephalus than pneumonia; though we must bear in mind that in the latter class of subjects the two diseases may often be associated. In all these difficulties the pungent heat of skin is a great aid, and should suggest a most careful examination of the chest; but it must be remembered that in the commencement of simple pneumonia, when from the period of the disease there is no loss of resonance to guide us, the crepitation is often not readily heard, and therefore it is necessary to make the patient take a very deep inspiration, at the termination of which it may generally be detected; or to ask him to cough, the doing which is generally preceded by such an inspiration.

In the commencement of ordinary pneumonia, which is the only stage in which it can be mistaken for bronchitis, the state of skin above noticed will be an important guide, to which may be added the dry crepitation, and the character of the expectoration already described. In the more advanced stages of the disease, the characteristic signs of pneumonic consolidation should render such a mistake improbable. The pneumonic crepitation, and the absence of the stitch in the side, will distinguish early pneumonia from early pleurisy: but the diagnosis between pneumonia that has advanced to consolidation and pleurisy that has gone on to effusion is not so easy: there is, however, more probability of mistaking pleuritic effusion for pneumonic consolidation than the converse, and therefore the diagnostic signs belong more appropriately to the former, and will be explained hereafter.

In forming a prognosis in a case of pneumonia, as of every other disease attended with danger, we must keep steadily in view the modes of fatal termination, as, by so doing, we shall more readily detect the signs which indicate such a result. Pneumonia is not often fatal in the first stage; it may happen, no doubt, that even at this period of the disease the extent of the lung involved may be such as to cause death by apnœa, or the intensity of the inflammation such as to be fatal by syncope. We have also stated a belief, in which, perhaps, all may not concur, that inflammation of the lungs sometimes proves rapidly fatal by the state of engorgement passing, almost suddenly, into one of effusion into the substance of the lung; constituting an inflammatory dropsy of the organ, and causing death by apnœa. It more commonly happens, however, that pneumonia does not prove fatal before hepatization commences; when, if the portion of lung affected be large, and the disease attended by extensive bronchitis, there often appear symptoms indicating failure of the strength, with increasing difficulty of breathing; and death takes place from apnœa. This change in the lungs sometimes ensues very rapidly, especially in a subject previously in a feeble state of health, and the patient may die in this manner within a week.

When, however, the danger arising from a tendency to apnœa has been escaped, the affected portion of lung frequently passes into the state of puriform infiltration, in which case death from sinking, or a tendency to failure of the heart's action, is to be apprehended.

The prognosis, then, of pneumonia is to be founded upon a careful consideration of the severity of the attack, upon the presence or absence of the signs of the fatal termination which we have described, and upon the constitution, age, or other circumstances in the condition of the patient, amongst which are to be included complications with other diseases.

When the patient is seen at the commencement of the disease, and is of moderately good constitution, and the inflammation not very extensive, especially if only one lung be involved; we may entertain a good hope of a favourable termination. If, however, the patient be advanced in life, or of generally unsound constitution, if the inflammation appear to affect a great portion of the lung, and still more, *if both lungs are involved*, or if there exist extensive bronchitis, or disease of any other important organ, the danger is great. And even in the first stage of pneumonia, if there be delirium or great oppression of the nervous system, and if the respiration be hurried, the countenance livid, the pulse very frequent and small, and the tongue disposed to become brown and dry, we may apprehend death by sinking or apnœa, or rather by a complication of both. When hepatization has taken place, the danger (besides the previous condition of the patient which bears upon all stages of the disease) depends chiefly upon the extent to which this change has taken place, and when that is great, if at the same time there be any of the signs already mentioned as indicating much impediment to the respiration and tendency to sinking, the prognosis is most unfavourable. At this period of the disease a moist and warm perspiration, with a somewhat increased fulness, but at the same time diminished hardness, of the pulse, is a favourable sign, as is also the appearance of a lateritious deposit in the urine, and may be expected to be followed by the further favourable symptoms of a diminution in the dyspnœa, and a recurrence of the crepitation in the portion of the lung which had been rendered irrespirable by the consolidation; and this sound, which has been denominated the "*râle crépitant redux*," is regarded as a sign of retrogression of the inflammation, and of the progress of the part affected to its normal condition.

A good deal of stress has been laid upon the appearance of the expectoration in regard to the prognosis; though perhaps, as Dr. Addison observes, more is due to the ease and freedom with which it is excreted: the sputa losing their very viscid and tenacious character, when there are other signs of the retrocession of the disease, show that but little remains but the bronchitis: the appearance of a little blood in the expectorated matter is by no means an unfavourable sign; but the sudden suppression of the expectoration is a very alarming circumstance, and indicates either great exhaustion or complete closure of the air-cells through a great extent of the lungs.

At a more advanced period of the disease the presence of pus, which has often a most offensive earthy odour, is a circumstance that ought to excite great anxiety, though it is not necessarily a fatal sign. It indicates, in conjunction with the symptoms which have been already pointed out (p. 237), the probable occurrence of the softening down into pus of the lymph which has closed the air-cells. This change may possibly lead to the ultimate recovery of the part; but as there is much greater probability of the substance of the lung becoming implicated in the suppuration, and breaking down at the same time, or, what is even more likely, of the patient's powers giving way during the process, it bespeaks a very critical condition. In this state of things our prognosis, though upon the whole unfavourable, must depend upon the constitutional powers of the patient. If the tongue be tolerably healthy in appearance, the pulse of good power, and if there be none of the stethoscopic signs of disorganization, but, on the contrary, some return of resonance on percussion, without any gurgling, though the soft crepitation may remain, and still more if the latter give place to the dry crepitation, we may hope that the process of cure is going on safely. Here, however, we cannot but watch the expectoration with considerable interest; the diminution of the fœtor, and of the proportion of pus in the expectoration, and subsequently of the quantity of the sputa themselves, are favourable signs; but if they become more and more offensive, and assume a pinkish or greenish hue, and have not the nummulated appearance, but run into one homogeneous mass, we may infer that disorganization, or even sloughing of the lung, is going on; and if at the same time the tongue become brown, or red and glazed, the pulse quick and feeble, and if there be decided hectic, with rapid emaciation and increasing dyspnœa, the prognosis is all but desperate. Dr. Alison remarks, and not without reason, that when the hectic which in a greater or less degree attends the suppuration consequent upon pneumonia is protracted beyond three weeks, ulceration of the lungs, commonly with tubercular deposit, may be apprehended.

There can be little doubt that the greater number of cases of active plastic pneumonia in previously healthy subjects are the direct result of severe exposure to cold, though in some, and those, too, of the most intractable character, there is every reason for believing that the disease is set up by the presence of a poison in the blood : thus it often occurs to all appearance spontaneously when the depurating action of the kidneys is arrested by disease of those organs; as well as in persons in whom there may be supposed to be an unhealthy condition of the blood from other causes; it occurs, also, in the progress of disease depending upon a morbid poison, as measles, influenza, and typhus fever. Pneumonia may also be excited by an irritation of a more direct character, as when it supervenes upon tubercles, or is set up by the accidental admission into the lungs of substances which irritate mechanically, or of acrid gases.

As an instance of the supervention of pneumonia upon the presence of a morbid poison in the blood, we must not omit to notice that form already alluded to, which occurs apparently in consequence of inflamed veins, or suppuration in other parts of the body, in which case the inflammation in the lungs rapidly and certainly assumes the suppurative character : these cases are generally fatal, though there may have been instances of recovery.

From what has been already said of the various effects of pneumonia upon the tissue of the lung, and of the different modes in which it may prove fatal, it is at once apparent that there must be a great difference in the means required for combating this disease; and further, that this difference must prevail not only in the different stages of the inflammation in the same or different individuals, but also in the same stage in different cases. Having said this, we should have thought that we had sufficiently guarded ourselves against being misunderstood or misrepresented, had it not been that pneumonia has been made in great measure the point of attack by those, who would impugn the means recommended by most physicians up to the present time for the treatment of internal inflammations, essentially wrong, as applicable to inflammation as such—overlooking or disregarding the fact, that all cautious practitioners have particularly insisted upon the restricting the use of such measures exclusively to a certain stage of the inflammation, and a certain state of the constitution of the patient—and who would appear to recommend an opposite mode of treatment as of universal application in all stages of the disease, and in every possible variety of the constitutional powers.

In the first stage of acute pneumonia in persons of previously sound health, and in whom the pulse is moderately firm, the treatment should be antiphlogistic—that is to say, the recumbent position should be enforced, and the patient restricted to the use of farinaceous diet, with the addition, where there are any signs of debility, of some light animal broth: the temperature of his apartment should be kept uniformly and moderately warm; at the same time that the easy action of the lungs should be insured by careful ventilation, so arranged as not to expose the patient to any current of air. The next question, *in the first stage*, must be as to the propriety of bleeding. In this we must be guided by the rules already laid down as to the treatment of inflammation in general. If the skin be hot, the tongue white, and the pulse *hard* and *not compressible*, the patient may and ought to be bled; but if the pulse be soft and easily compressed, bleeding, as a general rule, is inexpedient, and even dangerous, and ought not to be performed though the patient may have previously been in good health and of apparently sound constitution. When it is decided upon, the patient should be placed in a sitting posture, and blood allowed to flow from a vein in a full stream, until the patient feels signs of fainting, or until the pulse becomes *softer*, or, if it have before been contracted, fuller, or until the sense of oppression about the chest is diminished. The abstraction of blood in this stage of the inflammation has, in all probability, a double action: in the first instance, it has the direct sedative effect upon the heart, and larger vessels, which we have already (p. 92) pointed out, as applicable to inflammation in general, but also, in the present case, it diminishes the quantity of blood sent to the lungs, and thereby lessens the amount of function which they have to perform. The relief afforded by a full bleeding, thus opportunely timed, is very striking. Sometimes, however, although the breathing has been relieved, and the pulse rendered softer, or fuller, the symptoms will again become aggravated after some hours, when the venesection may be repeated with great effect; and in some instances there will be little need of further treatment.

When there is considerable hurriedness of the respiration, and the symptoms are in the main such as to justify the abstraction of blood, but we have any reason to doubt the tolerance of its loss, it will be well to cup the patient on the surface of the chest corresponding to the seat of the inflammation to six or eight ounces.

After the bleeding has been performed, and repeated if necessary, the next object is to secure a free evacuation of the bowels; for which purpose the combination of rhubarb and calomel, followed, if necessary, by a cathartic draught, or half an ounce of castor-oil, will be well fitted. When we have any doubts of the bleeding being well borne, it will be a safer practice to cup the patient on the surface of the chest, corresponding to the seat of the inflammation, to six or eight ounces—a measure which can be repeated if the inflammation should continue to extend.

It would appear almost superfluous to repeat that bleeding is recommended in no cases except those in which there are the symptoms which have been laid down as warranting its employment, and that in no case ought it to be performed simply because the patient has pneumonia; and further, that for some years past the cases in which bleeding has been justifiable have been extremely rare, the author not having seen more than three such during the last ten years. Still the practice is not the less applicable when such cases do occur.

Before quitting the subject, we would again call attention to the cautions which we have already given as to the abstraction of blood, in speaking of treatment of inflammation in general (pp. 94-105), and more particularly to the opinions there expressed that a partial subsidence of the inflammation having taken place after blood-letting, in those cases where it has afterwards extended, and given rise to effusions of an unfavourable character, is no proof that the bleeding has had no ill effect, since it may have disposed to an unfavourable termination.

The remedies which, next in order, demand our consideration are antimony, calomel, and opium. The former of these has been much recommended by practitioners in various parts of the Continent, more particularly by the French physicians, many of whom are in the habit of relying mainly upon it, for the cure of pneumonia. The practice which they recommend is to give it, in doses, commencing at about half a grain, and rapidly increased till irritation of the stomach and bowels ensues, after which if it be persisted in, what is commonly termed a tolerance will be established. The late Dr. Thomas Davis, however, was in the habit of administering the antimony in doses, commencing with one-third of a grain every hour, guarded by a few minims of tincture of opium at first, which last was omitted if no signs of vomiting ensued, and the dose of the antimony gradually increased till it reached two grains. Now, from the explanation which has already been given (p. 104) of the action of antimony on inflammation, it might be inferred that in this, the first stage of pneumonia, before the lung has gone into a state of consolidation, the antimony would be a most efficient remedy; and such is found to be the case in practice. In the acute pneumonia of sound subjects, provided the patient be seen in the commencement of the first stage, one bleeding, if the pulse and other symptoms warrant it, and the continuance of the antimony, in doses not exceeding one grain every hour, or hour and a half, will often be sufficient to check the disease. In general, the antimony acts best when it does not excite vomiting; and, indeed, the tolerance which is found to exist of these doses, which may be called moderate when compared with those of the French physicians, is of itself a sufficient evidence of the propriety of its exhibition.

It may, however, happen that the antimony will not be borne, or that the disease proceeds to the second stage in defiance of it; and, therefore, it is necessary to be provided with another remedy less irritating, and of which the operation will be appropriate to any consolidation which may have taken place. Such a remedy we find in mercury. Accordingly it will be generally found the best practice to administer the calomel and opium in the form of the pill already recommended (F. 3 or 4), twice or thrice a day, at the same time the antimony is being taken, which may be given in small doses in the intervals, according to the progress of disease; that is to say, if the antimony is not borne it may be diminished, and the calomel carefully watched, until some effect is produced upon the system, or the disease is manifestly subsiding. The cautions given respecting the use of bleeding apply equally to mercury, which is not to be employed, or employed very sparingly, in subjects of little power. (See p. 109.)

Even in this stage the disease may, as has been already pointed out, prove fatal by apnœa, owing to the great extent of lung involved in the inflammation. When there is a threatening of such an event, cupping over the seat of the inflammation, or between the scapulæ, if the general symptoms afford ground for believing that the patient can bear it, affords the best chance of safety: after the skin has become soft, a large blister should be applied to the sternum. Signs of sinking from the extent and intensity of the inflammation may also manifest themselves; in which case it will be necessary to administer wine and stimulants, the mercury in small doses and opium being continued, and a blister applied over the inflamed portion of lung.

In most cases we do not see our patients who are the subjects of pneumonia, until after the inflammation has proceeded to consolidation, when the difficulty of combating the disease becomes much greater. In this stage our object must still be to check the progress of the inflammation, and bring about, if possible, resolution, and promote the absorption of the inflammatory effusion; and in so doing, we must endeavour to prevent the occurrence of the third stage, or at least to guard against its disorganizing consequences; in other words, we must be careful to spare the strength of the patient. Now, here bleeding will not exert the same influence over the disease as in the stage of engorgement, and there is danger of its too far exhausting the powers of life; where, however, there is still considerable heat of skin, *with a hard pulse*, it may be ventured on, especially if there be dry crepitation still to be heard. As a general rule, however, it will be a safer and not less efficacious practice, to take a few ounces of blood by cupping from over the inflamed part of the lungs, and repeat the operation should the disease continue to extend; but even this is not to be done, if the pulse be compressible.

Our next object should be to promote the absorption of the effused lymph, which has caused the consolidation. Now, for this purpose we cannot look for much assistance from the antimony; but, according to the principles already laid down (pp. 107—111), we may hope a great deal from the use of mercury. The French physicians, indeed, recommend the tartar-emetic even in this stage, but the practice is not generally adopted by those of this country. As in the first we recommended the combination of calomel in moderate doses with the antimony, so in the second stage the combination of a little antimony with the calomel is found to be the most successful treatment, and to these opium is to be added, to allay irritation, and to prevent the calomel running off by the bowels. The best mode of proceeding, then, is to administer the pill (F. 3 or 4) two or three times a day, and in the interval about fifteen minims of antimonial wine in a mixture (F. 5). At this period of the disease, a blister may be applied with good effect, and repeated in the course of a few days. This treatment should be continued until there is evidence of the subsidence of the disease, in the diminution of the dyspnœa, and in the occurrence of the crepitation before mentioned over the seat of the consolidation; or until a slight effect is produced upon the gums; unless there be signs of the remedy disagreeing.

When amendment takes place, it will generally be best to diminish the quantity of the calomel, or to substitute for it two or three grains of blue pill, care being taken not to affect the system powerfully by the remedy; *which ought also to be withdrawn when there is pus in the expectoration, or any of the signs of a tendency to puriform infiltration, or grey hepatization, of the lung.* Should the remedy be well borne after the occurrence of the crepitation of returning respiration, it may be cautiously continued in diminished doses till that crepitation is succeeded by the respiratory murmur of health.

When, however, it happens that the gums become affected without any decided impression being produced upon the disease, the case becomes one of greater difficulty. Under these circumstances, if there be no signs of the medicine disagreeing, and no hectic or other sign of puriform infiltration, keep up a slight effect upon the mouth by *very* small doses of some mild preparation for a few days, when, if there be no symptoms of any return of the consolidated lung, towards its healthy condition, the mercury should be discontinued, in which case the counter-irritation should be repeated; and the mixture of extract of 14 conium (F. ~~23~~) be employed, to which, if there be but little cough, about a grain and a half of iodide of potassium may be added; and at the same time a grain of sulphate of quina may be given three times daily. It must be remembered that in this stage we may have the iron-grey induration supervene—a result which, although not amounting to a perfect cure, places the patient in comparative safety, as no fresh disorganization is likely to ensue until he is exposed to some fresh exciting cause of the disease: and, consequently, it will be more desirable to favour this result by avoiding every cause of irritation, and gently supporting the patient's strength, than to run any risk of inducing suppuration by efforts to procure absorption, especially by the excessive use of mercury. Patients, who have undergone this permanent change in a portion of lung, have not uncommonly a pale, doughy, and rather anæmic appearance.

We have now described the treatment which has been most generally employed in the first and second stages of pneumonia, and which we believe to be most applicable to the disease in its more sthenic form; but we have before casually remarked, and we would again draw more particular attention to the fact (for such we believe it to be) that this form of pneumonia has been of late years comparatively rare, and that in by far the greater number of cases of inflammation of the lung, as at present most frequently to be met with, so active a treatment is seldom required, and is frequently injurious. The cases to which we allude are those in which the pulse is soft, and the tongue not so white as in the more active form of the disease, but rather inclining to a drab or light brown. Yet in these the expectoration is as characteristic, and the stethoscopic signs as well marked as in those in which the inflammation is more active.

It will be perceived at once that according to the rules already laid down, depletory or reducing treatment is here inapplicable; but we would go even further, and add, that not only is bleeding dangerous, but that antimony is too depressing, and that mercury may lead to disorganization, rather than to resolution. The best plan of treatment will be found to consist in quiet and regulated temperature, and ventilation, as already enjoined, and the use of salines and very gentle mercurials, and, if necessary, anodynes. Such cases commonly do well upon the liquor of the acetate or citrate of ammonia, with a little ipecacuanha wine three or four times a day, and about two grains of mercury with chalk, and three or four of compound ipecacuanha powder at night. In rather more active attacks we have of late several times used the bicarbonate of potass, in scruple doses, every four or six hours, and with satisfactory results. In some of these cases, too, ammonia should be early administered; and when the pulse becomes very soft, about half an ounce of wine, or a quarter of an ounce of brandy, should be given every three or four hours.

In the stage of threatened puriform infiltration, our object must be to carry, if possible, the patient through a process of cure, which, as has been already pointed out, is attended with considerable danger: this danger arising from the texture of the lung becoming involved in the softening which is going on in the effused lymph, and the whole mass breaking down together. The object of the practitioner, then, in such cases, should be to allay irritation, and support the strength of the patient: for this purpose a bland nutritious diet is essential; good beef-tea and fish, or poultry or game when procurable, are good articles of diet; and where there is not great heat of skin, and the appetite tolerably good, a little mutton. Beer, or wine and water, or wine may also be allowed, their effects being carefully watched. The bowels must be regulated, and if the skin be moist, and there be no diarrhœa, the mixture (F. 29)* will be of use. When, however, there is a tendency to irritability of the bowels, the acid must be omitted, and about five or six grains of sesquicarbonate of soda may be added. If there be much flushing at night, with perspirations towards morning, the bark or quinine may be of service, provided there be no great heat of skin in the intervals. A good form in such cases is the pill (F. 30).† The recovery of the patient may be forwarded, when his strength admits of it, by a removal into a pure but mild air; he must also continue every precaution as to his mode of living and the avoidance of exposure to cold, for some time after the disease has apparently ceased, which may be known by the pus disappearing from the expectoration, and the return of the sounds of healthy respiration in the inflamed part, by the patient getting flesh, strength, and his natural complexion, and the pulse resuming its ordinary frequency. When the tissue of the lung with the effused lymph breaks down into suppuration, the case approaches very closely to one of phthisis, and must be treated accordingly.

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* (29) ℞ Acid. nit. ♏ iv.
Acid Hydrochlorici, ♏ viij.
Ext. Conii, gr. xij.—xv.
Ext. Sarzæ. ʒ ss.
Syrup. Aurant. ℥ ss.
Aq. puræ, ℥ iiiss. Misce.

Sumat part. 3iam ter die; or infusion of bark may be used as a vehicle instead of water.

† (30) ℞ Quinæ Disulphat. gr. iss.—ij.
Pulv. Ipecac. gr. ss.
Ext. Conii, gr. ij. ss. Misce.
Ft. Pil. ter sæpiusve quotid. sumend.

When a portion of inflamed lung becomes gangrenous, which may generally be known by the intolerably fœtid smell of the breath and expectoration, the case is nearly hopeless; though there is reason to believe that recovery does sometimes take place under the free use of stimulants, as wine, bark, ammonia, and æther.

After all that has been said respecting pneumonia and its treatment, it should be remarked that the details of the latter are not strictly applicable in every particular to the greater number of cases in which we have to do with pneumonia of some form or other; the fact being that *simple acute sthenic* pneumonia is by no means a common disease. Dr. Watson states that he rarely meets with more than five or six cases in a year, and in a vast amount of disease the author of the present work rarely finds more. Pneumonia is, nevertheless, a disease the consideration of which is of the utmost importance, since inflammation of the lungs supervening upon some pre-existing lesion is an affair of everyday occurrence. It is set up by the extension of the inflammation along the tubes in bronchitis, and by the irritation of the tubercles in phthisis, in the progress of which it plays a very important part. It is brought on by the pulmonic symptoms arising from disease of the heart, and it is excited by the state of the blood in diseases of the various depurating organs, especially of the kidneys. In all these different cases the directions which have been given for the treatment of pneumonia will require to be modified according to the general condition of the patient.

There is one form of pneumonia which may be regarded as the extreme instance of that condition in which the active antiphlogistic measures applicable to the acute sthenic affection are not admissible, and in which the very opposite mode of treatment is found the most successful; this is commonly known as *Typhoid Pneumonia.* There may be some question whether this disease belongs more to continued fever, or to ordinary pneumonia; indeed, most German pathologists are of opinion that the deposit in the lung is that which we have already spoken of as typhoid. This, however, it is impossible to prove, and the disease is certainly to be found in typhous, as distinguished from typhoid fever, and may be met with as an idiopathic affection. This form of pneumonia is often more insidious in its attack than is the sthenic: in some cases it is ushered in by rigors; but these are as frequently wanting, or so slight as to be overlooked; the patient merely having complained at times of being cold: there is commonly little or no pain in the chest; but the respiration is hurried, and the patient has an oppression of his breath; there is generally headache, and frequently early delirium. The tongue very soon becomes brown, and the teeth covered with sordes; the pulse also is very quick and feeble. The skin in the commencement of the disease has the pungent heat of pneumonia; but it is afterwards dry, but not very hot; the expectoration has in the earlier stages of the disease the characteristic viscidity; it is generally of darkish yellow, dusky brown, or sepia colour; it often, however, becomes mixed with pus, and not uncommonly assumes a dingy colour, and in a great measure loses its viscidity; the sputa running, as it were, together, and being of a uniform opaque dirty green, or brown character, of the consistency of thick gruel, with not uncommonly a fœtid odour.

The changes which are meanwhile going on in the lungs are, in the commencement, not very unlike those of acute pneumonia. There is first engorgement; but this engorgement is rather that of congestion than of inflammation: at all events, it does not give rise to the characteristic effusions of the latter, and possibly it is on this account that little or no crepitation is to be heard; what there is, is of a softer or moister character. In the next stage, the inflamed lung, instead of becoming consolidated by the effusion of plastic lymph, presents more of a soft pulpy consistence, not unlike that of the spleen. If, however, the inflammation be not at the very base of the lung, there will be bronchial respiration and bronchophony. The tendency of this form of inflammation is to disorganization, generally in the form of purulent infiltration, and breaking down of the tissue of the lung; it more often happens, however, if the disease be not arrested, that the patient dies with symptoms of exhaustion before those changes can take place. Typhoid pneumonia is very apt to assume the lobular form, affecting many separate lobules through the lung. When this is so, there will rarely be crepitation audible in the first stage, or bronchophony in the second, and the diagnosis is consequently very obscure. When, however, the patient is seen early, the viscid expectoration, and still more the pungent heat of skin, will enable us pretty surely to suspect what is going on; but where this is not the case, it is often next to impossible to distinguish the disease from low continued fever. It is fortunate, however, that the confounding this disease with fever, and treating it accordingly, is an error of far less practical consequence as regards the life of the patient than that to which those are liable who are guided solely by physical signs, and having by these detected pneumonia, would proceed to treat the typhoid as the acute. It is rarely, we would say never, that depletion can be borne in any stage of typhoid pneumonia, and it is only at the commencement that milder antiphlogistic measures are admissible; but it is very desirable to induce a gentle action of the skin and kidneys, and to allay irritation at the same time; care being taken not to depress the strength of the patient. It has been recommended to administer the tartar-emetic in pretty full doses, and bark or quina in the intervals. In general, however, the bark will not be well borne while the tongue is coated and the skin hot, and the best practice will be found to be the exhibition of acetate of ammonia (F. 31),* with a diuretic and light tonic or diffusible stimulant; small doses of ipecacuanha may be combined with it at the commencement of the attack. Owing to the disorganizing tendency of the disease, mercurials must be used with great caution, and as a general rule they are objectionable. Care should be taken from the first to support the patient by light nourishment, such as good animal broths and nutritious farinaceous food; and in most cases wine or brandy, in the small doses already recommended, should be given from the first. When the skin becomes less hot, if the pulse be not very feeble, a blister may be applied over the inflamed part; and at this period of the disease, also, ammonia should be added to the medicine, and the ipecacuanha withdrawn; and if the circulation continues to fail, the compound-sulphuric æther may be substituted for the nitric; the wine also may require to be largely increased as the typhoid symptoms become more urgent; and it not very rarely happens that the patient in this apparently hopeless condition recovers under the free use of stimulants.

The form in which pneumonia most commonly presents itself in large towns, is one which we should be inclined to regard as intermediate between the sthenic and the typhoid. It has not the hard pulse and white tongue of the sthenic, though it has not the signs of prostration which attend the typhoid. The auscultatory signs are, however, those of active pneumonia. These cases might no doubt be made typhoid by the use of the lancet; but they generally do well with small doses of calomel with antimony and opium, or even hydrarg. c. cret. and Dover's powder, aided by a saline and antimonial draught; a blister being applied after the skin has become perspirable: or perhaps a better mode of treatment may be the bicarbonate of potass.

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* (31) ℞ Sp. Æth. nit. ʒ ss.
Tinct. Hyosc. ♏ xx.
Liq. Ammon. Acet. ʒ iij.
Mist. Camphoræ, vel
Infus. Serpentariæ, ℥ j. Misce.

Ft. haust. 4^{tis} horis sumend. To this the sesquicarb. ammon. may be added, in doses of from two to five grains.

PLEURITIS.

As pleurisy or pleuritis consists essentially in inflammation of the pleura or serous membrane which invests the lungs and lines the walls and floor of the chest, and as the symptoms are for the most part directly connected with the changes resulting from that inflammation, it will be best, in treating of this disease, to commence with the description of the latter. The first stage of inflammation of this, as of every other serous membrane, is that of congestion or hyperæmia, in which the membrane assumes a red colour, in consequence of the apparently increased number of vessels ramifying immediately underneath its surface, this appearance depending, as has already been explained, upon the enlargement of the minuter capillaries, enabling them to admit the red corpuscles of the blood. It is not often, except in the case of accidents, or when the patient is cut off by some other disease at the commencement of an attack of pleurisy, that we have an opportunity of seeing the membrane in this condition. Such appearances have, however, under such circumstances, been ascertained to exist, and when an animal has been opened very soon after inflammation has been artificially excited in the pleura. At this time, so far from there being any effusion, the membrane is dryer than in health. This condition may either continue only a few hours, or may endure for several days, according to the greater or less intensity of the inflammation, or the greater or less strength of the constitution of the patient. The characteristic effusions of the inflammation then begin to show themselves. Now, it may be as well to bear in mind that these consist essentially in the first place of inflammatory lymph ; though this lymph admits of every possible gradation from plastic fibrinous lymph to corpuscular lymph with abundance of fluid. The plastic effusion generally first makes its appearance in thin layers or flakes upon the surface of the pleura, of a gelatinous consistency : these gradually become firmer, the fluid part either becoming absorbed or subsiding to the more depending part of the cavity. The more solid portion which is thus left adherent to the surface of the pleura is at first of a greyish-white colour, and somewhat pasty consistency. The layers or flakes of this substance have at this period a soft villous appearance, and may be readily peeled off from the inflamed membrane, leaving it red with stellated vessels. The serum is of a pale straw colour, at times transparent, and at others rendered turbid by the admixture of minute shreds of fibrine, and in some rare instances is coloured with blood. This then constitutes what may be termed the second stage of the disease, in which we have the soft villous layers of lymph adhering to the pleura, and the serous fluid above described gravitating in a greater or less quantity to the lower part of the cavity. From this stage the disease may follow several different courses.

In tolerably good constitutions the lymph becomes organized according to the process already described (pp. 49, *et seq.*). Now, we have already seen that if two surfaces of serous membrane, one of which is the seat of inflammation, are in contact, as would ordinarily be the case with regard to the costal or diaphragmatic, and pulmonic pleura, the inflammation extends by contiguity, and where there is a layer of lymph poured out upon one surface, the same takes place upon the opposed, and the minute vessels of each which are formed in the process of organization inosculate with each other, and thus adhesion is established. If, however, there is a large proportion of serum effused with the lymph, or in other words, if the effused liquor sanguinis contains a large proportion of fluid, the two surfaces will be kept asunder, and the adhesion prevented; in which case the soft villous coat already mentioned as adhering to the pleura undergoes the ordinary changes of effused lymph, becomes firm, and assumes the properties of areolar tissue, and thus a new or adventitious layer of false membrane (as it is frequently termed), is formed either upon the surface of the lining of the chest, or of the coating of the lung. The time required for the production of these coverings of organized tissue is exceedingly various; in some cases they are formed in a few days, and in others not within several weeks. Generally speaking, the plastic power is the greatest, and therefore early organization is more to be expected, in young and robust, than in debilitated, subjects. There is also a great variety in the extent to which these membranes may be effused; sometimes they cover the whole lung, and line the whole of the walls and floor of the cavity. There is also a great variety in the thickness of these membranes: sometimes they are scarcely thicker than the serous membrane itself; at others they consist of several layers, amounting to two or three or more lines in depth.

One remarkable property of these membranes, to which allusion has already been made, is their tendency to contract; and when the costal pleura is lined by a tolerably thick layer of lymph, whether that layer be adherent to the corresponding portion of the pulmonic pleura or otherwise, there will often be a drawing together of the ribs on that side, causing flattening of the chest and some amount of lateral curvature of the spine. When there is a large quantity effused, separating the lung from the ribs, absorption may take place, and the contact between them being restored, the contraction above spoken of will ensue. Sometimes, however, this absorption is suspended, and the side, instead of contracting, bulges out from the great accumulation of fluid: one effect of which is, that the lung is compressed against the bodies of the vertebræ, so as in some cases entirely to exclude the air, and give it the appearance of a dense fleshy mass, which, however, unless constricted by the false membrane, is capable of being again inflated; in this condition it is said to be *carnified*.

When this effusion is upon the left side of the chest, it often presses so strongly upon the mediastinum as to thrust it, and the heart with it, to the right side, so that the latter may be felt beating to the right of the sternum; sometimes, when it is on the right, the dislocation towards the left is perceptible: in the latter case, too, it often thrusts down the liver, so as to give the appearance of enlargement of that organ. When the fluid remains in the cavity of the chest for a considerable time, or when it occurs in an unsound constitution, it commonly assumes a puriform character, presenting every possible gradation between serum rendered turbid by the presence of a few pus globules, and perfect pus; this is termed *empyema*. When an empyema is thus established, the false membrane by which it is lined assumes the characters and properties of pyogenic membrane, and continues to secrete pus. This pus is commonly free from offensive odour as long as the air is excluded; but when any has been admitted, the fluid generally becomes intolerably fœtid. Both these statements, however, admit of exceptions. When the cavity of the pleura is thus filled with pus, it often happens, that, after a time, there is a bulging in one of the intercostal spaces, generally rather low in the chest, as between the sixth and seventh, or seventh and eighth ribs; which soon fluctuates upon being handled, and has all the appearance of an abscess pointing, as it is termed. If this be not opened by the knife, the pus makes a way for itself by ulceration, and thus escapes (a portion of it at least) spontaneously. Unless, however, the lung expand sufficiently to fill up the cavity of the pleura, which is rarely the case, the pus cannot all flow out, unless its place is refilled by air, and this is one way in which air is admitted into the cavity of the pleura, constituting what is termed a *pneumothorax*. Sometimes, again, but not so frequently, ulceration takes place through the pleura covering the lung, and thus the pus finds its way into the substance of that organ, and occasionally produces death by suffocation; at others a communication is established with a bronchial tube, and thus a large portion of the pus is got rid of by expectoration; at the same time that a pneumothorax is established by the admission of air through the opening. The fluid does not always move freely in the cavity of the pleura, as it is not uncommon for adhesions to form around an effusion either of serum or pus, constituting what is termed a circumscribed empyema. When an empyema of this kind points outwardly, or is opened by the surgeon, or when it opens by ulceration into the lung, there can be no extensive admission of air into the cavity of the pleura, and the lung is prevented from collapsing by the circumscribing adhesions.

Such are the principal structural changes in the pleura caused by inflammation of that membrane. It will be well next to connect these changes with the symptoms observed in the course of the disease. Pleuritis then commonly is ushered in by the ordinary signs of inflammatory fever, as pain in the limbs, rigors followed by heats, head-ache, scanty and high-coloured urine; the tongue is white and furred, the pulse rather hard and frequent, the skin hot but disposed to be moist, and differing much from the pungent heat of pneumonia. With these signs of constitutional disturbance there is first felt in the chest, and often at the seat of the inflammation, but as commonly under the breast, a sharp pungent pain, which often seems to shoot in various directions. This pain is always increased by drawing a deep inspiration, whence it is familiarly known as a stitch; by coughing, and often, though not always, by pressure upon the part affected. The pain gradually increases in severity: it is most severe in persons of vigorous constitution, but in some leucophlegmatic subjects the disease often creeps on insidiously, and with so little pain, that it is at first nearly overlooked. When the inflammation is near the apex, the pain is often very slight, but when near the angle between the ribs and the diaphragm, or upon the diaphragm itself, it is commonly most intense. There is sometimes considerable tenderness upon external pressure, in which case the patient lies most easily upon the sound side, generally with the shoulders rather raised so as to cause a curvature of the spine with the concavity towards the affected side. Often, however, there is no tenderness, in which case the easiest position is on the affected side, as the pressure, thus produced, helps to keep the ribs at rest, and thus in some degree prevents the pain which is caused by the respiratory movements. The expression of the countenance is very remarkable, being that of a peculiar smile or grin, to which the term *risus Sardonicus* has been applied; it arises no doubt from the constrained mode of breathing, and the continued apprehension of taking an inspiration, sufficiently deep to excite the sharp lancinating pain.

The constrained movement of the ribs and diaphragm which is thus produced furnishes one of the most interesting signs of this disease, though one which has not till lately received the attention which it deserves, and for the elucidation of which the profession is mainly indebted to Drs. Hutchinson and

Sibson, though its importance in connection with the ætiology of disease was noticed in the 'Guy's Hospital Report' of the year 1841,* and subsequently in the Gulstonian lectures. When the inflammation affects the pleura costalis, or a corresponding part of the pleura pulmonalis, the ribs on that side are nearly fixed, but the movement of the diaphragm is not impeded, and the respiration is abdominal; when, on the other hand, inflammation affects chiefly the pleura covering the diaphragm and that over the base of the lung, the respiration is for similar reasons thoracic, or more commonly carried on almost entirely by the upper ribs; often, however, the respiratory movement of either part is rather diminished than altogether arrested.

The next condition to be investigated is the respiratory sound: now, as has been already observed, the two surfaces of the pleura glide, in health, so smoothly over each other that none is elicited. In the earliest stage of the inflammation, before any effusion is produced, the natural secretion of the part being diminished or arrested, it is reasonable to expect that there may be some slight friction sound; and such a sound is stated by some authors to be one of the diagnostic signs of this stage of the disease: it may, no doubt, be sometimes heard, but it is very faint, and owing to the diminished motion of the part it is but rarely heard, and therefore but little value is to be attached to it in practice.

It is, however, in the next stage, that of effusion of liquor sanguinis, or inflammatory lymph, when the general or constitutional symptoms are but little altered, that the auscultatory, or one might say the physical signs generally, are of value; and we need merely revert to the statements already made, respecting the different forms which this inflammatory lymph may assume, to make it at once apparent that we shall have corresponding differences in the physical phenomena.

Let us take first the case, of the effusion of fibrinous lymph, with a small quantity of serum which is quickly absorbed. As the pain and tenderness of the membrane remain as at the commencement, the diminished mobility of the part will also continue, and the resonance will be but little affected; but we shall have the first unequivocal instance of those friction sounds to which allusion has already been made. In the earliest condition of the plastic lymph, as already described, it is soft and villous, not indeed moving with the ease and noiselessness of the healthy membrane, and not yet capable of producing any rough or grating sound. When therefore the ear or stethoscope is applied to the surface of the chest near the part which is in this stage of inflammation, we hear a very soft sound, which indeed can only with difficulty be distinguished from a moist crepitation or a fine bronchial rattle; when, however, the new membrane becomes firmer, from the further absorption of the serum, the friction sound becomes rougher, and, as it were, dryer, sometimes resembling the rubbing of the cuffs of the coat together, and sometimes having quite a rasping sound. In the latter instances, where, in fact, we have the friction produced by the tougher and nearly organised membrane, a vibration or "fremissement," may be distinctly felt by laying the fingers in the intercostal spaces over the part affected. When the inflammation is situated in the diaphragmatic pleura, and that part of the pulmonic pleura which is in apposition to it, there will of course be but little, if any, friction sound to be heard; and, unless it extend up the side of the chest, or there be effusion of fluid in sufficient quantity to make its presence apparent by the characteristic physical signs, we can derive but little aid from the stethoscope; and consequently the diagnosis becomes much more difficult. Under these circumstances, however, we may obtain much assistance from the general symptoms of serous inflammation, with the exception, however, that the pulse is often very small, contracted, or, as it is termed, wiry; and the general distress and expression of anxiety more intense: indeed there appears to be a remarkable tendency in inflammation of the diaphragmatic pleura to depress the moving powers of the circulation, not unlike that which we shall hereafter have occasion to notice as accompanying inflammation of parts immediately below the diaphragm. Another important aid to the diagnosis in such cases is to be found in the altered mobility of the ribs; the diaphragm on the side affected (and it is not uncommon for this form of pleurisy to attack both sides) is nearly fixed, as are also the four inferior ribs, termed by Dr. Sibson the diaphragmatic ribs. After all, however, it will remain very difficult, and in some cases next to impossible, to distinguish between diaphragmatic pleurisy and other inflammations in the same region of the body, or immediately below the diaphragm, especially inflammatory affections of the peritoneum covering neighbouring structures; since the immobility of the lower ribs and diaphragm and the depression of the circulation will often be the same.

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* *Vide* 'Guy's Hospital Reports,' vol. vi., p. 235 *et seq.*; and Gulstonian Lectures by G. H. Barlow, M.D., in 'Med. Gazette' for 1844.

When the effused lymph has formed adhesions between the two apposed surfaces of the pleura, the friction sounds will generally cease, but there will commonly, for a short time afterwards, be a creaking or leathery sound accompanying a deep inspiration: this will often continue with greater or less intensity till the new membrane has become organized, when the inflammation may be said to have ceased, and we have to do only with its permanent effects. There will also be immobility, or diminished mobility, of the ribs or diaphragm, according to the part affected; and where the lymph is very thick between the two surfaces of the pleura there will be defective resonance, owing to the diminished elasticity of the walls of the chest, but not the almost perfect dulness of, large serous effusion, or, extensive pneumonic consolidation.

When, however, as very often happens, the serum is not absorbed, and remains in considerable quantities in the cavity of the pleura, we have a different set of phenomena. If it be not circumscribed by adhesion it subsides to the lower part of the chest, raising in some measure the lung, which, when not consolidated by disease, is specifically lighter than the fluid: when the latter is not in any large quantity, there is no great impediment to the function of the lung, and consequently the pulse and respiration are but little affected; as, however, the quantity of the fluid increases, the respiration becomes much embarrassed; and since owing to the compression of one lung, the quantity of blood in the pulmonic circulation is much diminished, the quantity returned to the left side of the heart must be so likewise; and consequently, the pulse becomes either very small, irregular, or intermitting. Another effect of the diminished function of respiration and impeded pulmonic circulation is the imperfect aëration of the blood and consequent lividity of the lips and tongue, with congestion of the countenance. This obstruction of the pulmonic circulation also produces its ordinary results—obstruction to the return of the blood in the veins, and, when long continued, anasarca generally of the most depending parts, engorgement of the right heart and portal circulation, scanty urine and general derangement of the secretions. The position also of the patient may assist us in detecting pleuritic effusion: respecting this a good deal has been written, though not always very clearly. When there is much fluid in either cavity, it must necessarily happen that the pressure not only upon the lung on the side affected, but also upon the mediastinum and through it upon the opposite lung, must be increased by the recumbent position, and consequently there is most commonly orthopnœa, or if not that, a necessity for a semi-erect position. When, however, the quantity of the fluid is not *very* great it is reasonable to expect that the pressure upon the opposite lung will be the least, and consequently the respiration the easiest, when the patient lies on the affected side. Generally, however, owing probably to the larger hollow which is formed between the bodies of the vertebræ and the angles of the ribs, the patient lies easiest not exactly *upon*, but *towards* the affected side, in a *diagonal* posture, as Andral has termed it, resting, in fact, mostly upon the angles of the ribs of the affected side. Still there are many exceptions to this rule, depending partly, no doubt, upon the presence of adhesions, and partly upon the condition of the opposite lung ; so that cases are not very uncommon in which the patient may lie indifferently on either side, although one pleura may be quite full of fluid, and in some the patient even lies most easily on the sound side.

It is true, indeed, that all the above symptoms may arise from other causes than effusion, and therefore to these must be added the signs, arising from the physical changes, which may be detected by inspection, manipulation, and auscultation.

Now, effusion into the pleura in large quantities almost always causes a fulness of the ribs on that side, which may generally be perceived by inspection. It must not be forgotten, however, that it has been stated that the contraction of false membrane, formed by pleuritis, causes a drawing in of that side or bending of the spine towards it, the effect of which is to give an appearance of a bulging of the ribs on the opposite side ; and it is no imaginary case for the contraction of the plastic effusion of a pleuritis on one side to have given rise to the suspicion of a large effusion of fluid on the opposite. Not only is there this bulging of several of the ribs together, but there is often a degree of protrusion of the intercostal spaces, producing an appearance, especially in the lean subject, the very opposite of that which is commonly observed in health, namely, of these spaces being more prominent than the ribs : this is accounted for, by Dr. Stokes, upon the principle that the intercostal muscles lose their contractility, and consequently the power of resisting the pressure of the fluid within the chest, by their being overlaid by an inflamed membrane. And there is, no doubt, much truth in this explanation, but it is to be regarded rather as an illustration of an interesting pathological law, than as an aid to diagnosis ; since the fluid effusion may be present, but it may have been poured forth by a part different from that at which it produces the greatest lateral pressure ; as, for instance, the inflammation may have been in the pleura covering the diaphragm, but the effusion, if abundant, may ascend up the sides of the chest, and the pressure would be in the same situation as if the fluid had been poured out by inflammation of the costal pleura, but the intercostal muscles would not in this case have lost their contractility, and consequently no protrusion of these spaces would ensue. The bulging of the ribs may be more satisfactorily determined by comparing the corresponding measurements of the two sides, though it may be observed that this requires the greatest caution in adjusting the tape or whatever is used.

Considerable aid in the diagnosis of effusion may also be obtained by manipulation or manual examination of the chest and hypochondria. When the hand is placed upon the ribs of a person in health, while speaking, a peculiar thrill or vibration may be felt which has been termed the tactile vibration of the voice. This vibration is no doubt greater in some persons than in others, as in thin than corpulent subjects; it is less also in old than in young subjects, and is diminished by thick and firm adhesions, but in none of these cases is it obliterated, which however it is completely, when there is any considerable quantity of fluid in the pleura. When this is the case, and the palm of the hand is laid upon the lower ribs, vibration will not be felt in the slightest degree, and its absence may be rendered more striking by contrasting it with the opposite side; it will be more or less extensive according to the amount of effusion, and may generally be most plainly perceived over the angles of the inferior ribs. By manual examination the position of the heart may also be ascertained, and the presence of fluid in the left side often detected by its being thrust to the right; the dislocation of the heart towards the left side by fluid in the right pleura is not so obvious, and can only be observed when the fluid is in great quantity. The motion of the abdominal parietes in respiration should also be explored by the hand for the reasons already explained; though it should be remembered that other diseases will interfere with the descent of the diaphragm.

Percussion affords most important aid in detecting the presence of fluid in the pleura; as the resonance of the chest is diminished or impaired according to the amount of the effusion. It must be remembered, however, that a considerable quantity may be present at the base of the cavity without its being detected in this manner, especially on the right side, where the neighbourhood of the liver always causes a greater or less degree of dulness. When the quantity of the fluid is great, but not sufficiently so perfectly to destroy the resonance of that side of the chest, the dulness is commonly at the lower part, when the patient is sitting up, and may be traced in nearly a horizontal direction to the anterior. When the patient lies on his back the fluid will of course gravitate towards the posterior part of the cavity, and the dulness may be observed ascending more or less towards the anterior part of the chest, which, when the fluid is not in very great quantity, will become resonant, and this will aid in distinguishing it from the fixed dulness resulting from pneumonic consolidation: this sign, obtained from the shifting of the fluid, is not of universal application, and although its presence may be looked upon as conclusive in support of the question of effusion, its absence is not so against it.

The most important of the physical signs of pleuritic effusion, are those derived from auscultation. The principles which explain these characteristic phenomena are, that the effused fluid compresses the lung so as in some parts to prevent altogether its inflation in inspiration, and in others to modify the sounds of respiration; secondly, that the effused liquid and compressed lung are far better conductors of sound than the spongy texture of healthy lung; and lastly, that the vibrations of the fluid give a peculiar character to the sounds of the voice and respiration.

According to the first of these principles, we find that the respiratory murmur is commonly absolutely silenced in the part most compressed by any large effusion, as in the lower lobe when the patient is in the erect posture; whereas in the upper part of the lung, which is pressed against the walls of the chest, the vesicular murmur of respiration is more or less diminished at the same time that the conducting power of the lung is increased; the effect of which is to render the respiratory sound coarse and rather hissing. The sound of the air passing through the bronchia is also rendered more audible from the same cause: this, however, can only be the case where the lung is but little compressed, since the greater the compression, the less must be the amount of air passing through the tubes; therefore when the patient is in the erect position, bronchial respiration is to be heard only at that portion of the chest which lies near the upper boundary of the fluid (as indicated by dulness on percussion), and that not with the same degree of intensity with which it may be heard in consolidation. It should be remembered that as the lung is connected with the walls of the chest, near the bodies of the vertebræ, it must, when there are no adhesions, recede from the ribs when pressed upon by fluid; but as this pressure will be the greatest at the lowest part, it will be more compressed, and also recede further from the parietes at the base in the erect position, and will approach more closely to them higher up; and, except in cases of very great effusion, such as are rare when it is of an inflammatory character, there will be contact between the surfaces of the pleura above the fifth or fourth rib, the result of which must be a layer of fluid between the lung and the ribs, diminishing in width from below upwards: the effect of this is to give a coarse and rather hissing sound to the respiration above the highest line of the fluid: below this there will be little, if any, vesicular murmur, but the respiration will be tubular or bronchial, and at the same time distant, that is to say, not appearing to proceed to the ear from a point immediately below the ribs, but some distance beyond them; but lower still, where the stratum of fluid is of the greatest width, there is scarcely any respiratory sound to be heard.

It is well here to point out, that as the compression, and consequently the diminution of the respiration, is the greatest at the lowest part of the lung, there can be little air passing through the bronchial tubes above; which is one reason of the bronchial respiration not being so distinctly heard as in the case of pneumonic consolidation, where there is respirable lung beyond the consolidated part, and therefore air passing freely along the tubes which traverse it. As regards the voice, however, the case is different, for, as was remarked when we spoke of pneumonia, its sounds are not rendered audible at the surface of the chest by the transit of the air through the tubes, but by the propagation of the sonorous vibrations along the tubes; which vibrations, though they are not sufficiently intense to be heard through the healthy lung, become audible when there is condensed lung and liquid effusion interposed between the tubes and the walls of the chest; and thus it is that the vocal sound already described by the term bronchophony, is produced: the bronchophony being the most distinct, some little way below the highest line of the fluid, where there is sufficient compression to condense the lung around some of the tubes nearest the surface of the pleura, but not sufficient to obliterate them, or greatly to obstruct the sound. We have stated that the effused fluid has a peculiar effect in modifying the sound produced by the voice in the tubes: this consists in giving it a remarkable vibrating or tremulous sound, which we propose to term tremulous bronchophony. Laennec compared the sound sometimes heard under these circumstances, to the bleating of a goat, and called it œgophony; but this is a sound which we can very rarely hear, though when heard, it is most striking, and may be regarded as pathognomic. Its rarity is probably owing to a definite depth in the layer of fluid, and perhaps also a fixed size of the tube being required for its production. The more ordinary tremulous bronchophony, or, as some have termed it, œgophonic bronchophony, is a sound which may almost always be heard when there is a moderately thin layer of fluid between the ribs and the lung; it is generally discoverable, from the line where the resonance begins to diminish, to where the respiratory sound is altogether lost, and is one of the most constant and distinctive signs of pleuritic effusion, if not the most so.

Such are the principal signs of fluid in the pleura, by which such effusion can commonly be recognized. As, however, the diagnosis between this and the dulness arising from pneumonic consolidation is one of considerable practical importance, it will be well briefly to recapitulate the points of difference.

1. In the first place, the previous course of the disease, as far as it can be ascertained, is of some assistance. In pneumonia there is not necessarily pain in the side affected, and

when present, it is not severe; whereas that of pleuritis is sharp and pungent: in the progress of pneumonia there will generally have been the rust-coloured viscid expectoration; in pleurisy there is little or none: the occurrence of this expectoration does not, however, prove that the dulness in question arises from pneumonia, since, though this disease may be present, the probability is rather in favour of its being complicated with pleuritis.

2. Pleuritic effusion often distends the cavity, and either causes elevation of the intercostal depressions, displacement of the heart, or depression of the liver, none of which occur in pneumonic consolidation.

3. When the quantity of effusion is not so great as to render the whole side of the chest dull upon percussion, there will be a tremulous bronchophony a little below the upper line of dulness; and in the same situation tubular breathing may be heard likewise; but below this line the sounds of the voice and respiration are silenced altogether: in pneumonic consolidation, on the other hand, the dulness, and bronchial voice and respiration, are generally coextensive. When the quantity of fluid is such as to cause universal dulness, the sounds of respiration will be altogether silenced, although those of the voice may still be heard over the upper part of the lung, and we shall have the further distinction, in the case of effusion, of—

4. The absence of the tactile vibration, which, on the other hand, is not at all diminished by pneumonic consolidation.

It must be remembered, however, that although, in the majority of cases, the diagnosis between pleuritic effusion and pneumonic consolidation is comparatively easy, yet in some instances, amongst which may be reckoned, effusion circumscribed by adhesion, the distinction is next to impossible. Under these circumstances, too, there is some difficulty in distinguishing the former disease from enlarged liver, and from malignant disease of the lung or pleura.

The causes of pleurisy are—

Exposure to cold. This is perhaps the most common, if not the alone, cause of pleurisy as a primary affection. Even when thus produced, however, it is very often associated with pneumonia; the diseases under such circumstances are not to be regarded as cause and effect, but as the joint effects of a common cause.

It may arise from disorders of remote structure, as when disease of the liver or kidneys, but especially the latter, impedes the depuration of the blood by those organs, in which case, as we shall have further occasion to observe, inflammation is very apt to arise suddenly in some serous membrane.

Again, cases of pleurisy sometimes occur which depend on the presence of suppuration in other parts of the body, and also in specific inflammations of the skin, as erysipelas: these are of a peculiarly dangerous and intractable character.

The presence of other morbid poisons in the system may also excite inflammation of the pleura, as well as of other serous membranes; of this we have a familiar instance in the frequency and intensity of pleuritis occurring in influenza.

Pleurisy may also be excited by extension of disease in a neighbouring organ, the most common instance of which is, the inflammation of a part of this membrane covering a tuberculous portion of lung; it is also set up over a diseased rib; and sometimes, though not so frequently, by extension of disease below the diaphragm, as when intense inflammation occurs in the peritoneal covering of the latter. The same thing likewise happens occasionally in inflammation of the pericardium. Pleurisy may also be the effect of mechanical injury, as of the splintered ends of a fractured rib; and sometimes of a severe blow, independently of any such fracture.

The admission of air into the cavity of the pleura will almost always, though perhaps not universally, excite inflammation of that membrane; and thus it may be induced not only by accidental injuries, or surgical operations, in which the air enters from without, but also by the extension of disease in the lung to the surface, in which case the air enters from within. In this way, a tuberculous cavity may, by opening into the pleura, establish a communication between a bronchial tube and the cavity of that membrane. It ordinarily happens, that, as the inflammation extends towards the surface of the lung, the pleura covering it becomes inflamed; and this inflammation, extending by contiguity to the costal pleura, in apposition to the part, adhesion ensues; and thus the escape either of air or matter is stopped, and the great extension of the pleuritis is prevented. Sometimes, nevertheless, the ulceration reaches the pleura without any such adhesion, and the consequence is an escape of air, and perhaps matter, into the cavity. A pulmonary vesicle, distended by emphysema of the lung, and lying immediately below the pleura, may give way during some strong exertion, and thus an escape of air takes place into the pleura. In almost, if not in all cases in which air thus finds its way into the pleural cavity, inflammation of the membrane ensues, and the product of such inflammation is almost certainly puriform. Instances sometimes occur, indeed, in which, from the latter of the causes mentioned, namely, the sudden giving way of a dilated vesicle, there appears to be very little, if any inflammation or effusion in the pleura for a considerable time. There is, again, another way in which a communication may arise between the pleura and the bronchia, and that is, when a circumscribed pleuritic effusion ulcerates through the pleura pulmonalis; though its taking this course is far less common than its making its way through the intercostal spaces.

The presence of air in the pleura has been designated by the term pneumothorax: when, however, as generally happens, there is likewise fluid in the cavity, it is termed pneumothorax with effusion, and sometimes empyema with pneumothorax, or hydro-pneumothorax, which last term, however, is objectionable.

The invasion and presence of pneumothorax are characterized by remarkable symptoms, with which it is very necessary to be acquainted, and which are the result of the sudden admission of air between the two surfaces of the pleura, of the more or less rapid collapse of the lung consequent upon it, and of the inflammation of greater or less intensity, which nearly immediately follows it. We here speak more especially of those cases in which the pneumothorax is the result of admission of air through the lungs, since, in those in which it finds its way from without, the nature of the wound or operation renders the disease sufficiently obvious. When a pneumothorax is caused by perforation of the pleura from a vomical cavity, there will most commonly have been previous signs of phthisis, though not necessarily far advanced: the patient is suddenly seized with intense lancinating pain in the side, urgent dyspnœa, and frequently a great depression of the heart's action, threatening death from syncope, which sometimes actually ensues. It most commonly happens, however, that after a time reaction takes place, and there are the symptoms of severe pleuritis, though generally with considerable depression of the vital powers, the pulse being small and wiry; the patient breathes laboriously; generally reclines in a semi-recumbent attitude, with the shoulders raised, not turning, in most cases, entirely to either side, but assuming a sort of diagonal position, and supporting himself as it were upon the scapula; the side towards which he turns being either the sound or affected side, according to circumstances: most commonly, however, it is the affected side. At the first escape, indeed, of the air into the pleural cavity, the quantity of matter which accompanies it being, for the most part, small; the pressure of the sound lung (as well as of the heart, when the pneumothorax is on the right side) upon the mediastinum stretched over an empty cavity, might be supposed to cause some inconvenience, though this is very doubtful; but after a time, when the fluid has increased, far more is felt by the pressure of that fluid, or by its gravitating, through the opening in the lung into the trachea; and the patient then lies on the affected side. The dyspnœa almost always continues, in a greater or less degree; and when the quantity of air, or the subsequent effusion is very great, there will also be displacement of the heart, as in hydrothorax; sometimes also there is protrusion of the intercostal spaces.

The air, of course, escapes into the cavity, with greater or less rapidity, according to the size of the opening; and the distending force of the air in the lung being counterbalanced by that between it and the walls of the chest, the lung collapses by its natural elasticity, and, when not prevented by adhesions, is compressed into a small space against the vertebræ and mediastinum. Sometimes the opening in the pleura is valvular; and the air, entering at each inspiration, is unable to escape, owing to the closure of the valve by the greater pressure exerted upon the inner surface when the ribs descend in expiration; and the result is an enormous accumulation of air in the pleura, threatening suffocation; which, if the air be not allowed to escape, sometimes ensues.

It happens now and then that a person subject to emphysema of the lung, is suddenly seized with urgent dyspnœa during exertion, or in a fit of coughing; this is followed by signs of pleurisy, not commonly of equal severity with those in the former case: here a dilated vesicle has given way, and allowed the escape of air into the pleural cavity; the same thing may also be brought about in gangrene, or sloughing of the lung.

In the case in which an opening is made from the pleura into the lung, by an accumulation of pus in the former making its way into a bronchial tube, the collapse of the lung will generally be prevented by the surrounding adhesion, and the dyspnœa will rarely be urgent, unless the quantity of matter be so great as to be incapable of being expectorated with sufficient rapidity to prevent a considerable portion regurgitating through the tubes into the rest of the lung. These cases, too, are characterized from the first by a copious discharge of pus, which soon becomes fœtid.

The physical signs of pneumothorax are highly characteristic, precisely, in fact, what might be expected from one side of the chest containing air with some liquid, and the lung being collapsed. When the affected side of the chest is percussed, it emits, over a considerable extent, a sound far exceeding in resonance that of the same region when filled with ordinarily inflated lung, and more resembling the drum-like sound of a flatulent stomach: at the same time the natural sounds of respiration are perfectly silenced; thus presenting a contrast to the opposite side, where the resonance is somewhat diminished, and the respiratory sounds increased. When, however, the patient speaks or coughs, there will be heard a remarkable ringing metallic sound, which, from its resemblance to the ringing of a nearly-empty cask, has been termed amphoric, and which may be imitated by applying a child's india-rubber ball to the ear, and gently striking it. A similar sound may be elicited by gently tapping a chest in this condition, provided it be not done too near the part where the stethoscope is applied. These sounds receive a striking addition from the presence of fluid, the least agitation of which, from the movements of the patient, give a tinkling sound, the *tintement metallique* of French authors. The fluid, of course, occupies the lower portion of the chest, and the air the upper, and therefore, when the patient sits upright, the upper portion of the chest will be resonant, and the lower perfectly dull; the depth of the non-resonant portion depending upon the quantity of the fluid. The metallic sounds will generally be best heard a little below the nipple, and at the base of the scapula; and the relative situations of the dulness, and excessive resonance, may be changed by altering the position of the patient, just as in a barrel half full of liquid. Another remarkable sign is obtained by placing the patient in an erect position, and giving him a shake rather sharply, when a splashing sound may be heard, which can be compared to nothing better than the sound of shaking water in a barrel.

It may be as well here to remark, that the condition necessary for these amphoric or metallic sounds, is a large hollow containing air and liquid; and that a communication between the external air and this cavity are not so; and, therefore, we may have those metallic sounds should that opening become plugged up; and, in the hypothetical cases of air being secreted by the pleura, or of a cavity formed by the absorption of effused fluid more rapidly than the walls of the chest could collapse or the lung expand, to close the vacuum, we should still have these metallic sounds; and the same sounds may often be heard over the stomach, and in that situation have actually been mistaken, by experienced auscultators, for those of a pneumothorax, in a case where there was at the same time extensive pleuritic effusion. But when there exists a fistulous opening between the lung and the pleura, which is most commonly the case in pneumothorax, or when it continues unclosed, we have the additional sound of an amphoric voice and respiration, resembling that which might be produced by blowing into the mouth of a bottle.

The prognosis of pleurisy is generally favourable in the early stages, but must be modified, in a great measure, by the extent of the disease and the constitution of the subject; it is rarely, if ever, fatal before the effusion of any inflammatory product has taken place; but if a large surface of the membrane be suddenly affected, or if both pleuræ become inflamed at the same time, especially that portion which covers the diaphragm, the inflammation exerts a remarkably depressing effect on the heart's action, the pulse becoming feeble and contracted, and death from syncope may ensue in the stage of plastic effusion. It most frequently happens, however, that the inflammation yields to ordinary remedies, but permanent adhesion is the result; so common, indeed, is this, that, in the majority of persons, some portion of the pleura is found adherent after death. When, however, the layer of plastic lymph causing the adhesion has been of considerable thickness, there will be some contraction, producing often more or less deformity. These adhesions are a very frequent cause of pleurodynia.

When there is a considerable amount of serum effused, producing compression of the lung, in the manner already described, the prospect of recovery will depend much upon the quantity and character of the fluid: when it is not very great in quantity, nor of a puriform character, its resorption may pretty confidently be expected; but, if the quantity be very great, which may be ascertained from the signs already stated, there is danger of suffocation from the rapid compression of the lung: if this do not take place, the absorption of the fluid will probably be very slow, and if it be of a puriform character, which may generally be suspected from the occurrence of chills, followed by flushings of heat, the danger will be still greater; or the fluid may assume still more the character of pus, and degenerate into chronic empyema, which may empty itself either through the lung or the wall of the chest, or may continue a source of constitutional irritation; and, in either case, there is much reason to apprehend that the patient will sink under hectic. Such, then, being the modes of fatal termination of pleurisy; it is evident, that where the disease attacks both sides of the chest, or where the effusion takes place very rapidly, and to a great extent, our prognosis must be very guarded, if not unfavourable; and the danger must be considered as still greater when there is the slightest appearance of hectic.

In any individual case, a subsidence of the fever, and corresponding relief of the pain and dyspnœa, with the absence of all symptoms of increasing effusion, are to be considered as favourable omens. Whilst aggravation of the pain, increased difficulty of breathing, and still accumulating effusion, especially if the pulse become rapid and feeble, whilst there is an appearance of lividity in the countenance, are indicative of most imminent danger; and in double pleurisy about the diaphragm, even if there be little or no liquid effusion, any sign of failure of the heart's action must be viewed with the greatest apprehension.

It has been already stated that inflammation of the pleura may be excited by morbid poisons, as in the case of influenza or eruptive fever, and may arise from non-depuration of the blood, as disease of the liver and kidneys, especially of the latter. In these cases the prognosis is more unfavourable, and must depend principally upon the character of the primary disease. There are also, undoubtedly, instances of pleurisy (as observed by Dr. Alison) of peculiar fatality, and little influenced by treatment, which depend upon the presence of suppuration in other parts of the body, and of puriform matter in the circulation: in both these the effusion is puriform probably from the commencement; and there are cases, seen chiefly in hospital patients, in convalescents from febrile diseases, and especially from small-pox, which would seem to be of the same specific and peculiarly intractable character. Pleurisy, arising from perforation of the pleura pulmonalis, is almost always fatal, though the time which a patient may survive is much longer than used generally to be supposed. Andral states that death almost certainly takes place within a few days: this, however, is at variance with the experience of British practitioners, as many cases are on record, in which life has been protracted for a considerable time: instances of this kind are mentioned by Dr. Watson: one is related by Dr. Houghton, in which the patient survived thirteen months: and one occurred to the author of this work, in which the patient lived three years after the establishment of a fistulous communication between the lung and the pleura.* It is, moreover, remarkable how little distress is occasioned by this state of things, persons having been known often to take active exercise, and even to hunt without complaining of any inconvenience beyond the annoyance of the splashing of the fluid in the chest. In childhood and early youth, however, the prognosis of pneumothorax with effusion, though certainly unfavourable, is not so desperate as in persons more advanced in life. A patient of the author's, a lad of ten years old, was the subject of a pneumothorax, with abundant fœtid puriform effusion in the left pleura, fifteen years ago. Suffocation impending the fluid was let out by a puncture between the ribs, the patient slowly but steadily regaining flesh, and losing the dyspnœa, and after some months, the left lung was perfectly inflated, though by what means nature closed in the pulmonic pleura the orifice is not very apparent. He is now a well-grown young man in good health.

The *treatment* of simple *acute* pleurisy in its early stages, and in patients of sound constitution, should be decidedly antiphlogistic. It has been already observed, that bleeding is better borne in inflammations of serous membranes than of almost any other tissue of the body. When, therefore, a patient is seen while the stitch is severe, the tongue furred, the pulse sharp, and before there is any considerable amount of effusion, it will generally be not only safe, but highly expedient, to bleed him, in an erect posture, to a pint, or to the first signs of fainting; and this may sometimes be repeated with advantage within twelve hours; and it is to be remembered that the bleeding so timed, tells more upon the inflammation, and less upon the strength of the patient, than at a later period of the disease. Even here, however, it is necessary that what has been stated, respecting the depressing influence of acute inflammation in the neighbourhood of the diaphragm, should not be forgotten, and, therefore, in such cases, when the pulse is wiry, the effects of loss of blood should be carefully watched, and the vein closed upon the slightest approach of syncope; and if the pulse do not increase in volume, after the first bleeding, a second should on no account be ventured upon. When the state of the pulse or the constitution of the patient is such as not to warrant general bleeding, from twelve to twenty leeches may be applied to the side; or, what is still better, blood may be taken from the same part by cupping, to the amount of ten or twelve ounces; and even in cases where there is very considerable depression, cupping to a small amount is often very beneficial, as much perhaps from the revulsive effects of the glasses, as from the actual abstraction of the blood. The combination of tartar-emetic, calomel, and opium, which has been already recommended, will here also be highly beneficial: indeed, if the inflammation be not at once arrested by the bleeding, the disease will rarely be subdued until some effect has been produced upon the mouth by the mercury. For this purpose it will be well to give from two to four grains of the calomel with half a grain of opium and one-fourth of a grain of the tartar-emetic: the latter of these medicines has not, indeed, the same powerful effect in this disease as in inflammations of some other structures, but thus given it is a useful adjunct. The opium is serviceable as a sedative, and in preventing the mercury from running off by the bowels; and should there be any tendency to diarrhœa, it may be increased to as much as a grain. When the pain is in some degree subdued, the skin cool and moist, and the pulse softened, the application of a blister to the side will greatly accelerate the cure.

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* Vide 'Guy's Hospital Reports,' vol. iv. p. 339.

We would again repeat, though with slight modification, the cautions to be observed in regard to bleeding which were given in speaking of pneumonia, and add that when there is considerable effusion blood should not be taken.

In cases of less intensity the bicarbonate of potass, and small doses of compound ipecacuanha powder with hydrarg. c. creta, will be found a safe and an effective plan of treatment.

Sometimes, however, notwithstanding the use of these means, the difficulty of breathing and of lying down is increased, although the pain and fever may have subsided, and we have unmistakeable signs of accumulation of fluid in the pleura, namely, dulness, bronchophony, and, perhaps, bulging of the ribs; and the removal of this fluid will often be a work of considerable difficulty. To promote this, the patient should be kept on moderately low diet; a slight mercurial action should be maintained, blisters repeatedly applied to the side, and diuretics administered. The best form of mercurial in this condition of the patient, is the combination of the blue pill, or, what is still better, the grey oxide of mercury, with compound squill pill, which, while it maintains the mercurial action, aids that of other diuretics. As regards the effect of the latter remedies, there is at all times considerable uncertainty, which is mainly to be attributed to the condition of the other viscera; yet, as recent inflammatory effusion into the pleura does not necessarily imply previous disease, either of the heart, lungs, liver, or kidneys, we shall commonly succeed in obtaining a free action by a judicious combination of diuretic medicines. Saline diuretics, as nitrate or acetate of potass, in combination with infusion of digitalis, and nitric ether, will often succeed, the latter medicine rendering the action of the digitalis much more certain and more safe. The infusion of the digitalis is to be preferred, as being the most diuretic form for its exhibition, and being the least likely dangerously to depress the action of the heart. Should these remedies fail in their effect, or should they appear to reduce too much the strength of the patient, the iodide of potassium may be substituted for a time; purgatives should be at the same time freely employed, of which the compound jalap powder is generally to be preferred.

By perseverance in this plan of treatment, the absorption of the fluid may often be brought about, and the lung restored to its healthy state. Sometimes even after the fluid has been absorbed, the affected side does not return to its natural condition, but becomes contracted or shrunk, owing in this case to the lung, which has been tied down by adhesions, not expanding to meet the ribs as the fluid diminishes; whilst the consequent pressure of the atmosphere, often, no doubt, aided by the contraction of the false membrane, thrown out upon the costal pleura, compresses the ribs inwards towards the mediastinum. It has been supposed, indeed, by some, that the fluid absorbed under these circumstances is replaced by a secretion of air from the pleura, thus giving rise to a pneumothorax; but this is very doubtful. In most cases of this kind, the lung never fully expands again, and the flattening of the chest, and the curvature of the spine which generally attends it, remain for life, though this is not attended with any serious inconvenience, beyond the deformity, except in the cases of young persons whose growth is not complete, in whom, as we shall hereafter explain, everything which diminishes the capacity of the chest is a serious evil. In such persons, however, there is reason to believe that the natural form of the chest may sometimes be in a great measure, if not entirely, restored. The same thing may happen where the effusion has been almost entirely plastic lymph, but little serum having been poured out. In this case, after the pain and fever have subsided, the shrinking sometimes continues, and the side remains dull on percussion, owing to the thickness of the new membrane, and to its impeding the vibration of the ribs. Besides the deformity, this new membrane is sometimes an additional source of mischief, since it may itself become the seat of fresh disease, as by going into suppuration, or becoming a nidus for tubercles.

If after the means which have been recommended for bringing about the absorption of fluid in the pleura have been perseveringly used, there is no apparent diminution in its quantity, or if it should suddenly increase so as to threaten to destroy the patient by suffocation, the important question arises, as to whether it should be got rid of by making an opening into the pleura, that is to say, by tapping the chest. Although this operation is neither difficult nor, generally speaking, immediately dangerous, it may be well here to protest against its indiscriminate or too early employment; not only on account of the danger of admitting air into the pleura, which would, according to the principles already laid down, convert a serous effusion into a puriform fluid, but also because experience has taught us that, independently of such an accident, its repetition would produce the same result, and we have already seen that in the majority of cases such an effusion may be got rid of by other means. In short, the objections to the operation may be thus summed up,—where it is safe and likely to be successful, it is unnecessary, but where it seems to be called for by the permanence of the effusion, it is more dangerous, and generally unsuccessful.

As long, then, as we believe the fluid to be serum, the operation ought not to be had recourse to, except to avert impending suffocation. It is true, indeed, that *éclat* often accrues to the practitioner from its performance, but it is no less true that in the majority of instances the safety of the patient is compromised. When, however, we know, no matter by what means. that there is a large quantity of pus in the cavity of the pleura, the reasons in favour of its withdrawal are apparently stronger: nevertheless it may well be doubted, whether the results of experience will show that it has more frequently been productive of good than harm; for, though it is contended by many that pus cannot be wholly absorbed, yet the familiar instance of hypopion proves that it may be, in a great measure, if not entirely; and there is every reason to believe that in the cases under consideration, the serous part of the pus may be removed by absorption, leaving the pus globules in the form of a cheesy mass, which produces no serious inconvenience; and where this is not the case, the process adopted by nature, of finding an exit for the matter by slow absorption, going on in one of the intercostal spaces, and causing a pointing externally, will generally be found to give more safe and certain relief than the apparently more expeditious, but possibly premature, interference of the surgeon. It is, however, but fair to admit, that there is considerable difference of opinion on this subject, and that some writers of deservedly high authority recommend the withdrawal of pus whenever it is known to exist in the pleura.

When the urgency of the case calls for the performance of the operation, the next thing to be determined is, where it is to be performed. Now it may seem superfluous to say, "Be careful not to tap the wrong side of the chest;" yet such a thing has happened, and the respirable lung having collapsed from the admission of air into the chest, the result was, as may be expected, the instant death of the patient. A blunder of this kind, arising from ignorance as to which pleura is the seat of the effusion, would be little less than criminal with our present means of diagnosis. The best point to select in the side will generally be between the angles of the sixth and seventh rib, but here, before proceeding to introduce a trochar, it will be well to place the presence of the fluid beyond a doubt by the introduction of the grooved exploring needle of Dr. Davis, or, what is still better, the small exploring trochar and canula first used by Dr. Babington, which has the advantage, not only of deciding upon the presence of fluid, and its serous or puriform character, as well and as safely as the needle, but also of admitting the introduction of a small silver probe, by which the distance between the lung and the ribs may be ascertained, and the quantity of the fluid, as well as the presence or absence of adhesions, inferred.

When the fluid that flows through the canula is serum, it will be best to allow it to run as long as it will continue to do so without the admission of air into the chest, and then the orifice should be closed; but when it is puriform, the fluid may be allowed to run as long as any can be obtained, and the orifice may be left open. For some excellent directions as to the best mode of performing the operation, as well as valuable suggestions respecting the diagnosis of empyema, the reader is recommended to consult an able article by Dr. Hughes and Mr. Edward Cock, in the 'Guy's Hospital Reports,' Second Series, vol. ii., pp. 48, *et seq.*

Whatever opinion we may form as to the expediency of tapping the chest—and it is not to be concealed that many physicians entertain opinions far more favourable to it than those expressed above,—there are objections to it in cases where the pleuritis is associated with extensive consolidation, and which will become more apparent as we proceed to speak of the complications of pleurisy, pneumonia, and bronchitis with each other.

Chronic pleurisy.—As in the case of chronic pneumonia, so also in that of chronic pleurisy, there is often considerable obscurity as to whether the affection is the sequel of an acute attack, or whether it is essentially a chronic disease from the very commencement. We have already seen that effusion of serum or pus, or merely a thickening of the serous membrane, may be left by an acute pleurisy; but in many instances the disease has undoubtedly assumed a chronic character from the first; and so nearly impossible is it to draw the distinction between the acute and the chronic affection, that we have spoken of empyema, or the effusion of pus, under the head of acute pleuritis. In the more purely chronic forms, however, the effusion is mainly, if not entirely, serous. Dr. Wilks observes that "in some forms of pleurisy a very rapid pouring out of fluid takes place, not so quickly, indeed, as the more solid products of lymph, which occur in a few days, but generally in the course of about two or three weeks, when the chest may be found having some lymph lining it, but at the same time filled with a serous fluid." These cases most frequently occur in persons of advanced life, of cachectic habit of body, especially in anæmic subjects, and those who have diseased kidneys. In some instances, more especially where the effusion is wholly serous, the disease comes on so insidiously that the presence of the fluid would never be detected, perhaps hardly suspected during life, but from the physical signs. After death the chest is sometimes found filled with pure serum, the lung being compressed against the bodies of the vertebræ. The serous membrane presents, to all appearance, no deviation from the healthy state; and we must admit that its pathology has yet to be explained.

Another form is the chronic thickening of the pleura. This in many cases, no doubt, has been preceded by an acute attack, but in others it has clearly not occurred. In some instances there has been at first an effusion of soft plastic matter, as evinced by the lung separating easily from the walls of the thorax; but when a transverse section is made, each succeeding layer, as we proceed inward, is found more and more dense. In the slowest and most decidedly chronic form there is no evidence of any soft matter whatever having been poured out, the thickening being more of the character of a growth, generally affecting the upper lobe, and associated with what has been spoken of as cirrhosis of the lung, to which it appears to be closely allied.

The physical signs of chronic pleuritic effusion are the same as those of effusion from the acute disease, the difference consisting wholly in the absence of pain, and of symptoms of inflammatory fever. The chest ought, therefore, to be from time to time explored in those who are the subjects of Bright's disease, or are of that cachectic and anæmic habit of body which has been specified as giving a proneness to this affection. The chronic thickening is a very obscure disease; sometimes there is here and there a dry, rough friction sound, and at others imperfect respiratory sounds, with diminished vocal powers; the resonance on percussion is also defective, as is also the mobility of the ribs.

In some cases of chronic pleurisy with effusion the fluid will become resorbed under the use of diuretics such as have been already recommended (p. 271), with the exception, that we must be even more cautious in the use of mercurials, and that where there is evidence of kidney disease they should not be administered. Counter-irritation should also be perseveringly employed; perhaps there is no better method than the repeated application of blisters, either in the form of acet. lyttæ, or the application of the plaster of lytta for about six or eight hours, so as to produce free vesication, without much inflammation. Care must also be taken to sustain the patient with good nourishment and a moderate allowance of stimulants, according to his previous habits. The treatment of the solid albuminous effusion must be nearly the same as of chronic pleuro-pneumonia.

XIV.

COMPLICATIONS OF BRONCHITIS, PNEUMONIA, AND PLEURITIS.

In treating of pneumonia, we alluded to the frequent coexistence of bronchitis; now it is needless to do more than repeat this to make it apparent, that a large number—the larger number—of cases of pneumonia, which we meet with in practice, must present symptoms different from those which have been described as belonging to pneumonia simply as such. If, however, the above fact be borne in mind, the bronchitic complication need not embarrass us much; since the symptoms are such as might be expected from the coexistence of the two diseases. The rattle may, indeed, mask the bronchitic crepitation, as the rattles and ronchus in the larger tubes were stated to have obscured those in the smaller; but generally there will be crepitation to be heard over a greater or less extent, and, if the pneumonia proceed, the occurrence of dulness on percussion will at once decide the matter. The expectoration will often be of a mixed character, being more fluid than that of simple pneumonia, but possessing a degree of viscidity that does not belong to the sputa of uncomplicated bronchitis. The constitutional symptoms, again, will be of an intermediate character; the skin will always at some period present the characteristic pungent heat of pneumonia; but this will not be of so long duration, and even while it lasts there will be a tendency to coolness, or even moisture, about the extremities. The pulse, also, will be softer, and the tongue redder at the edges.

As regards the prognosis of the disease, it must be regulated upon the principles already laid down in treating of each of these diseases singly; but in the expectation of perfect and permanent recovery we must not overlook the effect of pneumonic consolidation in promoting dilatation of the bronchial tubes.

The contraction of the fibrinous effusion constituting the consolidation, by drawing the walls of the tubes asunder, aids the other causes which have been mentioned (p. 223) in producing that lesion.

The treatment of this complication must be regulated upon the same principles. If what has been stated respecting the indications for bleeding in pneumonia be applied to the case in point, the existence of this affection will not lead to its adoption merely upon the grounds of the presence of pneumonia, though the existence of bronchitis should always act as a caution to dissuade from its too ready adoption, and stimulants will, in general, be early required.

Peripneumonia notha.—Closely connected with the complication of pneumonia with bronchitis is the peripneumonia notha, or catarrhus senilis, of the older authors. These cases are, in fact, little more than instances of asthenic bronchitis occurring in persons generally advanced in life, who have been subject to long-continued congestion of the lungs, the consequence either of repeated bronchitis or disease of the heart; but, besides this, the inflammation in the smaller tubes is very apt to extend to the air-cells, and pneumonia of an adynamic type is rapidly or almost suddenly excited. The symptoms of the disease are generally those of severe and extensive bronchitis, threatening death, sometimes from apnœa,—at others from asthenia, either from the depressing effects of the inflammation upon a feeble constitution, or from the exhaustion consequent upon a profuse puriform secretion. It not uncommonly happens, however, that there is great relief from a copious expectoration.

The pulse is commonly feeble, though it may appear hard from the condition of artery so common in advanced life. The tongue is red at the edges, but coated in the centre, and soon evinces a tendency to become brown and dry; the skin is often hot, especially over the surface of the trunk, though the extremities will soon become cool and clammy.

Dr. Watson remarks that the nicety of treatment required in certain stages of acute bronchitis is still more apparent and necessary here. But it may well be doubted whether we are ever called upon to take blood in any way, though the assumption, from the age of the patient, that the disease is peripneumonia notha, and not acute bronchitis, ought not to deter us from moderate antiphlogistic measures, when called for by the symptoms and powers of the patient. At the same time we must be very cautious not to mistake the hard artery (p. 74), for a hard pulse, and be misled by it into the belief that the patient can bear bleeding.

The treatment, then, must be that of bronchitis, with the anticipation of a failing of the constitutional powers. The liquor ammon. acet. with a little vinum ipecac. may be used at the commencement, and ammonia added in excess, when signs of debility appear. When the skin becomes perspirable a blister may be applied to the chest. The intercurrence of pneumonia rarely calls for active antiphlogistic measures, and should the sputa assume the "plum-juice" appearance, it is rather an additional reason for support and stimulants. It is very seldom that we can dispense with them from the first, and they should be so given as to sustain without exciting. This is best effected by administering about two teaspoonfuls of brandy every three hours. The combination of senega with ammonia and squills (F. 27, p. 221) is often of the greatest service in the advanced stages of peripneumonia notha.

In the scarcely less common complication of pneumonia with pleuritis, generally known as *pleuro-peripneumony* or *pleuro-pneumonia*, there will be a blending of symptoms, which, however, will not mask them, so as to occasion any real difficulty; neither is there any reason for supposing that the complication increases the danger. When large effusion takes place, the stethoscopic signs of the pneumonia will be, in a great measure, silenced by the compression of the lung; but in the commencement, the crepitation may generally be distinctly heard; and after slight effusion, it may sometimes be detected above the level of the bronchophony, or above the line of dulness.

The treatment of pleuro-pneumonia must, in general, be conducted upon the same principles as those laid down for pneumonia and pleuritis. There is, however, a form of complication which is worthy a short consideration, and that is the coexistence of extensive bronchitis, pneumonia, and pleuritic effusion in the same side of the chest. When this takes place, the lung will not collapse so readily as when it has been unaffected, and universal dulness of that side will be caused by a less amount of effusion than would have been otherwise necessary to produce the same effect, the anatomical condition being an uncollapsed, because consolidated, lung, surrounded by serous or sero-puriform effusion, the bronchial tubes being also more or less inflamed. But though the lung is, from the change in its physical condition, not susceptible of being collapsed, it is, nevertheless, compressed sufficiently to arrest the progress of the disease, or, at all events, to retard it, so that the effusion may be looked upon, as, to a certain extent, conservative.

Suppose now that the effusion were suddenly withdrawn—the consequences would be that the inflammatory changes would again proceed, and, if the subject were of feeble constitutional power (and it is in such that we most commonly meet with the above condition), it is highly probable that disorganization would be the result, and the patient sink under its exhausting effects. If, however, the fluid were to be slowly removed, we might expect that the lung would either return to the healthy condition, or go into the state of permanent induration; in which case the contraction of the pulmonary tissue would draw asunder the walls of the bronchial tubes. But as bronchitis already exists, it is probable that as the lung begins to be again inflated, it will resume its activity, and a considerable puriform secretion will ensue, which will tend to increase the distension, which sometimes becomes so great that the sounds of cavities are produced in the tubes.

From this we would infer, that, under such circumstances, it would be highly inexpedient to draw off the fluid, and further, that when such cases go on favourably, the progress would be, considerable puriform expectoration, contemporaneously with the diminution of the fluid; the first sounds of respiration to be detected in the lung being of a cavernous character, resembling those heard in vomicæ, though sometimes these pseudo-cavities may be so large as to give rise to sounds simulating amphoric ones. Such cases do not uncommonly occur, and the preexistence of pleuritic effusion, the subsequent copious puriform expectoration, and the cavernous or even amphoric sounds, have led to the belief that there had been perforation of the pleura, and that the patient was bringing up the contents of an empyema with pneumothorax. They may, however, be accurately distinguished from the latter, by the previous history,—by the stethoscopic signs during the effusion, since (though there is universal dulness, and absence of respiratory sound) bronchial breathing and bronchial voice, though distant, may still be heard; which they would not be in cases of perfect compression of the lung,—by the absence of any history of a sudden perforation, and lastly,—by the nummular character of the sputa.

These cases will often do well with the treatment recommended for that of pneumonia in the state of grey hepatization, with diuretics, repeated blisters, and good nourishment.

Chronic pleuro-pneumonia, or cirrhosis of the lungs.—We have already (p. 232) spoken of induration of the lung as one of the possible effects of acute pneumonia, at the same time that it was stated, and for the reasons there given, that it was more frequently produced by a chronic change in the tissue of the lung, generally extending to the pleura.

In the more purely chronic cases the induration is found to consist of fibrous tissue, having, as Dr. Wilks suggests, the character rather of a new growth than an inflammatory exudation. This condition, as has been stated, generally occupies the upper lobe of the lung, so that when the apex is cut into it is found very hard, as if the scalpel were entering a schirrhous mass. When opened it is found to be of a dark iron-grey colour, from the increase of pigment, and quite impermeable to air, owing to the pleuræ as well as the fibrous tissue around the bronchial tubes being involved. The contraction, which commonly takes place subsequent to the process, causes the tubes passing through them to be stretched open; and they may be seen gaping widely over the surface exposed by the incision. Sometimes this disease, or degeneration, extends to the whole of the lung, and has received the name of cirrhosis, from its supposed analogy with the disease of the liver of that name. In many of these cases there have been no symptoms indicating inflammatory action during life; and often the case is supposed to be one of chronic phthisis, and in a practical point of view it may be regarded as such—an opinion which the appearances after death may at first sight tend to confirm, the cut granular surface having much the appearance of tuberculous deposit, with which, however, it must not be confounded. On the other hand, however, we certainly do meet with cases in which there has been manifest febrile action, generally with a persistently hot and dry skin, with the exception, perhaps, of some tendency to night perspiration—the auscultatory signs being those of consolidation of the lung, often advancing from above downwards—and in which the above appearances have been found after death; though during life it would have been next to impossible to pronounce with certainty that the disease was not true tuberculous phthisis. Other cases, again, present themselves in which there has been the same amount of inflammatory fever, with the same auscultatory signs, and in which, under careful management, the disease has been checked, though consolidation of greater or less extent has continued, and the patient has regained a fair state of health, though liable, no doubt, to a relapse.

The treatment of this form of disease of the lung must be much the same as that recommended for the latter stages of pneumonia. We must endeavour to allay irritation, support the powers of the system, and, as far as may be, to promote the absorption of any inflammatory exudation of morbid growth, or at least to check its progress. For this purpose we believe that the mixture of conium and soda (F. 24, p. 220), with the addition of tincture of bark, may be of service, or

F. 32* may be employed. Should there be hectic, F. 29 and 30, (p. 248,) may be substituted. The diet should be as good as the patient's digestive powers will admit of, and a moderate or even liberal quantity of wine allowed. Contra-irritation, in the form either of blisters allowed to remain over the affected part for about six hours, and frequently repeated, or, of the frequent application of the compound tincture of iodine should be perseveringly employed. When the health of the patient, and other circumstances, admit, change of air or climate, such as those to be hereafter recommended in the early stages of phthisis, should be advised.

We have before (p. 227) spoken of collapse of the lung, or, as it has been termed, apneumatosis. This consists essentally of a non-inflation of the lung, and may be produced either by pressure upon any portion of the organ, expelling the air, and not allowing it to re-enter; or by obstruction of a bronchial tube, of greater or less size, preventing the inflation of a proportionate quantity of lung, that portion being further compressed by the inflation of the surrounding parts. This state occurs, in its physiological condition, in the fœtus before the first act of respiration; and it sometimes happens that after birth a portion of lung remains uninflated, *i.e.*, in a state of apneumatosis. This fact was noticed by Dr. Joërg, of Leipzig, who described it under the name of atalectasis, and called attention to its importance in a medico-legal point of view in reference to infanticide. Several years ago Dr. Alderson directed attention to this return to the fœtal state in certain portions of lung, and showed how it might be produced by whooping-cough, in which, by dilatation of the tubes, pressure might be exerted upon neighbouring portions of lung, giving them an appearance which had often been mistaken for lobular pneumonia, from their being more solid than the healthy lung tissue. We have also seen how the same thing may occur from dilatation of the tubes under ordinary bronchitis. Many years ago the author of the present work published illustrations of defective expansion of the lung occurring in early youth.† The causes there assigned for this condition were, besides pressure and mechanical obstruction to the respiratory movements,—narrowness of the trachea, the calibre of which was in several instances remarkably small,—and an impediment to the descent of the diaphragm from former pericarditis. In some of the cases it was questionable whether there were not also signs of inflammatory action in the portion of lung affected, a difficulty which is noticed by Dr. Wilks, who thought the two conditions may be combined by an inflammatory exudation in the collapsed part. Of the treatment of collapse of the lung there is not much to be said. Of the sudden form which occurs from the obstruction of a large tube we have already spoken. That class of cases of defective expansion in young persons is but little amenable to treatment, beyond the promoting the development of the chest by carefully regulated exercise, pure air, and a moderately tonic treatment; and the obviating those diseases of the heart, liver, and other organs which are induced by the obstruction to the pulmonic circulation.

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* (32) ℞ Pot. Bicarb. ʒss.
Ext. Conii, gr. xv.
Ext. Glycyrh. ℈ j.
Tinct. Cinchonæ, co. ʒii.—ʒiii.
Sp. Piment. ʒ ss.
Aq. puræ q. s. ut ft. Mist. ℥iv.
℥iv de quâ sumat. part 3^{iam} ter die.

When there is not much cough, from one to two grains of iodide of potassium may be added.

† 'Guy's Hospital Reports,' First Series, for the years 1841 and 1842.

Emphysema of the lung.—Closely connected with the subject of collapse of the lung is the opposite condition of emphysema. This word is used in a twofold sense: the first denotes dilatation of the pulmonic vesicles, without breach of their walls—this is vesicular or pulmonary emphysema; the second, the escape of air between the cells and into the areolar tissue at the base of the lungs—this is interlobular emphysema.

The vesicular, which is the ordinary emphysema, is easily recognized after death by the clusters of dilated vesicles, like small bladders, fringing the anterior edge of the lung. This condition is most frequently met with in those who have suffered from chronic or protracted bronchitis, or chronic phthisis. It was supposed by Laennec to have been caused by obstruction in the bronchial tubes, and consequent distension by the returned air, during the effort of expiration. It must be evident, however, that as the air is expelled by pressure upon the cells from without, and this pressure must be very nearly uniform, that it could not produce this effect. The explanation given by Dr. Gairdner is therefore more probable, namely, that it is consequent upon collapse of small portions of lung, and is produced during expiration; for the collapsed portions of lung not being able to expand, there must, from this cause, be a diminished resistance to the expansive force of the inspired air, and thus the cells become dilated during inspiration. Emphysema may therefore arise from whatever produces contraction of a portion of the lung, and therefore it occasionally, but not constantly, occurs in the progress of phthisis.

The only necessary auscultatory signs of vesicular emphysema are an increased resonance on percussion, and diminished respiratory murmur.

The general symptoms are dyspnœa, coming on in paroxysms, often associated with attacks of bronchitis, but frequently without any obvious cause. They make their invasion often in the night, or about two o'clock in the morning, and closely simulate those which are presently to be described as characteristic of asthma. In fact, this form of emphysema must be regarded as one of the causes of that disease. The cause of these paroxysms occurring in the night is probably the impediment to the ready descent of the diaphragm opposed by the pressure of the abdominal viscera during the recumbent posture; the consequence of which must be a gradually increasing congestion of the lungs and of the right side of the heart.

Vesicular emphysema of the lungs, as such, is but little amenable to remedies, and our treatment must be, in a great measure, limited to the negative one of anticipating and preventing those circumstances which are most likely to aggravate its more distressing effects. With this view, all excitement and exertion, and whatever tends to hurry the respiration, should be carefully avoided; and consequently all the causes of catarrh and bronchitis should be as cautiously guarded against, and, when they occur, instantly met by prompt but gentle measures. Uniform moderately warm clothing should be employed; and when there is sufficient strength in the circulation to produce reaction, the cold shower-bath or tepid sponging-bath should be used as a prophylactic. The pulmonary circulation should also be kept free by relieving it through the portal system by means of gentle aperients; such as one or two grains of pil. hydrarg., with a little compound colocynth pill at bed-time, followed, if necessary, by a gentle aperient draught in the morning. When the paroxysms of dyspnœa occur, the most efficient medicine for relieving them is about twenty-five minims of the sp. æth. co., with the same quantity of tincture of opium; to this, in very urgent cases, may be occasionally added half a drachm of the tincture of lytta. The effect of this last medicine is sometimes almost magical.

Asthma.—We have just seen how diseases of the kind just described may produce paroxysms of dyspnœa, which are often spoken of as asthma, but there is, besides, the true or spasmodic asthma, which is associated with little or no anatomical change in the respiratory organs, and which probably is of a purely nervine origin. On this account in the former edition of this work it was included amongst the diseases of the nervous system, but for convenience sake we have now given it a place amongst those of the former.

An attack of asthma is generally preceded by signs of disorder of the digestive functions; there are flatulent distensions, headache, lassitude, depression of spirits. Towards evening there may be weight and oppression across the chest, with some difficulty of breathing, and perhaps in this state the patient retires to rest. The urgent dyspnœa comes on after midnight, generally about two or three o'clock in the morning, when the patient awakes with a feeling of constriction across his chest, and an inability to draw in his breath. He is compelled to rise, and sits bending forwards, with knees drawn up, labouring for breath, and often wheezing loudly, and complaining of an apprehension of impending suffocation; he expresses an urgent desire for fresh air, and will go and open the window to get breath; and, what is characteristic, he rarely experiences any ill effects from so doing. The face is often livid from congestion, at other times pale and shrunken. There is generally much palpitation of the heart, with a feeble, and sometimes intermittent pulse, indicative of obstructed pulmonic circulation. If there be any urine voided, which there not uncommonly is at the commencement of a paroxysm, it is copious, pale, and limpid, like that of an hysterical female. The bowels, too, are often relaxed, with a spasmodic action.

The fit lasts for several hours, and generally subsides towards morning, when the dyspnœa begins gradually to subside, the patient is enabled to breathe, speak, and cough with ease, and at last sinks into a quiet sleep. This is often preceded by a copious, thin, frothy expectoration. When this occurs, the patient is said to have *humid* asthma, but sometimes there is none, when the case is said to be one of *dry* asthma. These paroxysms will sometimes recur for several nights in succession, the patient often saying in the intervals that he feels quite well, though there is generally apparent more or less difficulty in speaking.

The absence of all structural lesion in the chest, as well as the general spasmodic nature of the attack, the almost hysterical symptoms, and the pale, limpid urine, all tend to show that asthma is a nervine affection, probably of a spasmodic character, the seat of the spasm being in the muscles which encircle the air-tubes.

The circumstances which excite the paroxysms show that the spasm may have a centric or excentric origin, originating, in the former case, in the nervous centres; thus mental emotion will often bring on an attack; and as instances of the latter, we may adduce gastric irritation, the pneumo-gastric being in this case the incident nerve which conveys the impression to the centre. It is not, therefore, surprising that bronchial irritation should be another cause, and that whatever produces a strong impression upon the bronchial membrane should induce an attack: thus changes in temperature, or in the humidity of the atmosphere, will often bring one on; though different asthmatic subjects are variously affected in this way, an unusual degree of moisture bringing on a paroxysm in some, whilst others rest best in low, damp situations. The susceptibility to asthma often arises from hereditary predisposition; it appears also to be induced by a lax habit of system, by gout, and by long-continued dyspepsia.

From the dyspnœa of emphysematous lung, or dilated tubes, as well as from that from disease of the heart and large arteries, asthma may be distinguished by the absence of the physical signs of those affections, and, by the paroxysms generally coming on at night.

The prognosis of asthma is in early attacks favourable; but a frequent repetition of them may exhaust the strength of the patient, and induce emphysema of the lungs, enlargement of the right heart, obstruction of the pulmonic circulation, and death from apnœa.

During an attack of asthma, if there be signs of great congestion about the head, a few ounces of blood may be taken by cupping between the shoulder-blades; but as a general rule the abstraction of blood is to be avoided. The combination of the compound spirit of æther with the opium, and occasionally the lytta recommended when speaking of emphysema, will often give great relief during the paroxysms. The chloric æther may sometimes be substituted for the Hoffman's anodyne, or given in conjunction with it.

Another means of relief is the smoking the leaves of the stramonium, and a very efficient remedy is the respiration of air impregnated with the fumes of nitrous acid, emitted by burning nitrate of potass. The latter may be most conveniently applied by soaking pieces of blotting-paper in a saturated solution of the salt and then drying them. When the paroxysm comes on, one of these may be placed in a common plate and ignited. The room will thus soon become filled with the fumes, and in many cases the patient is relieved in about a quarter of an hour.

In the intervals between the paroxysms, every precaution must be taken to improve the general tone of the system, and thereby diminish that excessive susceptibility of the nervous system which is in all probability one of the links in the chain of causation. As an adjuvant for this purpose, a course of sulphate of zinc, carried to the extent of about four grains three or four times a day, may be had to recourse to.

The causes of the paroxysm are so various, that it requires experience of each individual patient to foresee what may excite them in his case, and this more particularly applies to locality. One very frequent cause is deranged digestion; or it may be that the mere healthy process will induce a fit through excitement of the pneumogastric nerve. The diet, therefore, ought to be light, and the meals taken at reasonable intervals.

Hæmoptysis.—This is the word commonly used to designate pulmonary hæmorrhage, though, literally, it means spitting of blood in general. This form of hæmorrhage is important chiefly in its relation to the primary disease of which it is the consequence, and it is upon this account that its diagnosis is a matter of much importance.

Although, as we have said, the term does not necessarily imply pulmonary hæmorrhage, yet other hæmorrhages are often termed spurious hæmoptyses; such are discharges of blood from the mouth or fauces, or from aphthous tonsils, or from the gums. Delicate and hysterical females, and those prone to uterine derangements, are also subject to hæmoptysis. Sometimes it may be from the lungs. In the former of these cases the source of the blood will generally be apparent upon examination of the mouth. In the latter there is more difficulty; but the general state of health, the presence of hysterical symptoms, or suppression or irregularity of the catamenia, together with the character of the sputa, will in most instances enable us to decide the question as to whether the discharge be a true hæmoptysis or a vicarious discharge. It must not be forgotten, however, that females of a tuberculous diathesis are prone to amenorrhœa.

True hæmoptysis may occur in every possible variety of quantity: it may appear as a bright florid streak in frothy mucus, or a little blood intimately mixed with expectoration of a more puriform character; or it may be poured forth in a stream, or rather torrent, of unmixed blood. In the former case there is little difficulty in the diagnosis, as the presence of cough, and other pulmonic symptoms, show that the expectoration is from the lungs. In the latter some care is requisite to be sure whether the blood is poured out from the trachea or the œsophagus; whether, in fact, the case be of hæmoptysis or hæmatysis. The appearance of the blood when first emitted will generally aid us; as, in the case of hæmoptysis, the blood is more florid than in hæmatemesis. If, however, the patient be not seen till some time afterwards, there may be more difficulty; but in the case of hæmoptysis there will probably have been pain across the chest, and generally tickling or irritation in the throat before the hæmorrhage, whereas in hæmatemesis there will have been sickness. In profuse hæmoptysis, too, after the first discharge, there will generally be cough and expectoration of bloody mucus or clots of blood, and it rarely happens that there are the pitchy stools which almost always follow hæmatemesis. The examination of the lungs will often be decisive, though not always: since the profuse hæmoptysis is not uncommon at the commencement of tuberculous disease of the lungs, and before the presence of such disease is manifest by any physical signs. The causes of hæmoptysis resolve themselves into—(1.) Diseases of the lungs and air-passages,—as tubercles, more rarely bronchitis (and to a slight extent pneumonia), and fungoid disease; in the latter case the blood is never in any considerable quantity, and has much the appearance of currant jelly; (2.) Diseases of the heart and blood-vessels;—as disease of the heart, especially of the mitral valves, and aneurism.

As regards the special diagnosis of hæmoptysis, it must be considered in connection with the above diseases, and we have here little to add to what we have said of the principles of its treatment when speaking of hæmorrhage in general, further than what applies to those particular kinds of which we shall speak hereafter.

XV.

PHTHISIS.

THE word phthisis is derived from the Greek verb φθινω (corrumpo), and therefore strictly means a wasting disease. It has, however, been generally used in medicine, and that from the earliest times, to signify a wasting dependent upon disorganizing disease of the lungs; and the term has been still further restricted by most modern pathologists to those cases only in which this disorganization is the result of tuberculous deposit. It will, however, be more convenient, as well as more in accordance with what has been already stated in speaking of the effects of inflammation and of scrofulous and tuberculous deposits, to include under the term phthisis all those cases in which there is strumous deposit in the lungs, although it may not be of that character which strictly belongs to what we have already described as tubercle: the course and symptoms of the disease are, however, in either case so nearly the same, that, for practical purposes, the distinction is perhaps rather nominal than real.

As pulmonary phthisis is one of those diseases the chief symptoms, and fatal termination, of which are dependent upon a series of morbid changes effected in certain organs, we first describe those changes and afterwards the symptoms resulting therefrom. These changes are, in fact, precisely those which have been described as brought about by tuberculous deposits in general. These are at first the small grey semi-transparent tubercles of the size of millet-seeds, or the larger crude yellow tubercles (p. 116) deposited in clusters in the lungs, the latter being sometimes, though not necessarily, a more advanced stage of the former. These tubercles then begin to soften, with greater or less rapidity, as already pointed out (p. 117), involving in their disorganization the portion of lung in which they have been deposited; the product of which joint disorganization is a thick, apparently puriform, fluid, contained in a cavity often lined, like an abscess, by a layer of fibrinous matter: or several of these clusters or centres of disorganization running together enclose an isolated portion of comparatively healthy lung, and thus a larger cavity or vomica is formed. This disorganized mass generally makes its way by ulceration to the nearest mucous surface, *e. g.*, a bronchial tube, and thus the contents of the cavity may be expelled. Fresh tubercles are in the mean time deposited in the neighbouring parts of the lung, and in this way the greater part of the organ is destroyed.

The tuberculous deposit, unless its seat is previously determined by some local irritation, such as pneumonia, almost always commences in the apex of the lung; and as the tubercles in this situation proceed soonest to enlargement, softening, suppuration, and expulsion, and as fresh deposits of the same matter are continually taking place, lower and lower down in the organ, and following the same course, we commonly find after death that the disorganization is most perfect in the apex, as shown by cavities of varying size, but generally large; whilst lower down we see cavities generally smaller or less close together than above, the intervening space consisting in great measure of lung apparently in a state of pneumonic consolidation, more or less thickly studded with tubercles. Still nearer the base there may be the above condition of lung without cavities, and lowest of all, there will commonly be respirable lung, nearly or entirely free from tuberculous deposit.

It is an important fact, and one bearing closely upon the pathology of pulmonary phthisis, that with the traces of disorganization, such as have been described as taking place generally in any tissue which is the seat of tuberculous deposit, we almost always find evidence of inflammatory action of greater or less activity. The lung surrounding a cavity is almost always condensed and solid; and the cavity itself, when the tubercles are first expelled, is soft and ragged on its inner surface. It afterwards either extends by the softening of other tubercles in the immediate neighbourhood, which form fresh vomicæ that open it, so that an irregular, or, as it is sometimes termed, multilocular, cavity is produced; or, if there are no tubercles very near, a layer of fibrinous matter is deposited, which becomes organized, forming a species of lining membrane to the cavity, the vessels of which sometimes pour out pus; but at others the fresh membrane contracts as in ordinary inflammation, and the cavity cicatrizes, as it were, and is ultimately obliterated, giving rise to a puckering of the pleura on the corresponding surface of the lung.

When this happens, the disease is arrested in the particular part, and a cure would take place if there were no fresh deposits in other parts of the same or corresponding organ; but this, unfortunately, is very rarely the case, for, on the contrary, fresh deposits of tuberculous matter are, in by far the greater number of instances, continually taking place, and in this manner the disease is incessantly advancing by the repeated deposition of tuberculous matter, and not, as in the case of malignant growths, by the continual assimilation of the adjacent tissues to their own structure.

We see, then, that the process of disorganization of the lung in the ordinary progress of phthisis is in a manner twofold, for we have the deposition of the tuberculous matter enlarging and softening ; and involving, in this softening and disorganization, the tissue in which it has been deposited ; and besides this, another induration and subsequent softening and ulceration, closely resembling, or rather identical with, that which takes place in common inflammation.

Here, then, we are met by two questions which have been much agitated, and which it is impossible altogether to evade, though a lengthened discussion of them would be foreign to the object of the present work : 1, What is the particular tissue of the lung in which the tuberculous deposits take place ? 2, Are they the product or the cause of the inflammatory action with which they are associated ?

(1.) As regards the seat of the deposit, it is probable that the opaque crude or yellow tubercle is deposited on, or rather *in*, the lining membrane of the smaller tubes (as pointed out by Dr. Carswell), and in the air-cells with which they communicate, thus giving rise to the little clusters of crude tubercles, like bunches of grapes, which may be often seen on making an incision into a phthisical lung ; whereas the grey semi-transparent tubercle is deposited in the cell, or in the cell wall, as in the case of the product of common inflammation of the lung, and gives rise to the appearance commonly described as miliary tubercle.

(2.) As regards the connection of tubercle with inflammation, —although we have no proof that this deposit occurs as an immediate product of inflammation, yet there can be no doubt that the hyperæmia, or local determination of blood (p. 40) attendant upon inflammation, may so greatly favour the deposition of tubercle, that it may, in a number of instances, practically be regarded as its proximate cause, or, in the words of Dr. Alison, "Phthisis pulmonalis very frequently appears in practice as a consequence of inflammatory diseases ; usually of repeated attacks of them in their milder and more chronic form." This statement, which regards inflammation as the most prominent cause of that impaired nutrition of which tubercle may be the result, is not necessarily opposed to the belief that such derangement may arise independently of inflammation; and therefore we are willing to admit, in the words of the distinguished physician already quoted, that "phthisis sometimes shows itself and makes progress, chiefly in those most strongly predisposed, without any indications of inflammation preceding or attending it." There is, however, every reason to believe that such cases are very rare.

It has been already stated, in treating of common inflammation, that we may have, as its products, inflammatory lymph or pus, the former of which, though capable of becoming organized and forming a permanent tissue, is, nevertheless, liable at any period of its progress to break down into the second, and in so doing to involve the tissue in which it has been deposited in the same process of disorganization; and also that, after it has become perfectly organized, this new tissue may become the seat of a fresh inflammation, which will generally be of a suppurative or disorganizing character. Accordingly, as was specified in treating of pneumonia, the product of inflammation in the lung is, in sound subjects, almost always plastic, tending, if the inflammatory process be not arrested, to permanent induration of the organ; but under unfavourable conditions, and in cachectic subjects, pus may be poured forth in the first instance (or corpuscular lymph, which quickly becomes pus), or even if the product have been in the commencement of the plastic kind, it may, before it is completely organized, break down into pus, involving (as does tuberculous matter) the pulmonary tissue, in which it has been deposited, in a like disorganization; and even when induration of the lung has actually taken place, and possibly when it has existed for months or even years, the part so affected may, under a fresh attack of inflammation, break down into suppuration, and form a cavity closely resembling one which has been formed by the softening down of the tuberculous deposit.

The above description includes the various forms of phthisical disorganization of the lung, which may be classed under three heads: 1, The truly tuberculous, in which the deposition of tubercles takes place without being preceded, attended, or followed by pneumonia, and in which the disorganization is the result of the softening down of the tuberculous matter, involving in its disorganization the tissue in which it has been deposited; 2, That in which inflammation, if it have not preceded and given rise to the formation of tubercles, arises in the course of their development, and is the main instrument by which the disorganization of the lungs is effected; and 3, That in which the disorganization of the lung and the formation of vomical cavities have their origin in pneumonia, and may be brought about without any true tuberculous deposit, though this change rarely takes place independently of a tuberculous diathesis, and is rarely completed without the diseased structure becoming the seat of tuberculous deposit to a greater or less extent. So that we may have three classes of phthisis: (1), The tuberculous; (2), The tuberculo-pneumonic; and (3), The pneumonic. This classification of the varieties of phthisis was introduced by Dr. Addison, to whom also we are indebted for the description of the third or pneumonic variety. Of these varieties of phthisis, the first is very rarely, if ever, met with in practice in its perfect form, since inflammation, though it may not have originated the tubercles, is almost sure to affect some portion of the organ in the process of softening. Still, as this inflammation is rather an accident than essentially necessary, we cannot altogether disregard the theoretical possibility of the first variety. The second variety is by far the most common, and may be said to include nearly all the cases of phthisis in early life, occurring in subjects not previously injured by great exposure or intemperance. The third variety belongs more to the middle period of life, and it is probable that the greater number of cases of phthisis occurring near or after the age of forty are of this character, though, like the first variety, it is no doubt extremely rare in its perfect form.

Phthisis is also divided, by many authors, into acute and chronic, as it sometimes runs an acute course, but much more frequently a chronic one. As therefore the latter may be considered the more typical form of the disease, we shall speak first of it.

Chronic phthisis has been commonly divided into three stages, depending upon the anatomical changes which take place in the lung, which stages are pretty well marked by certain physical signs, as those of deposition, softening, and ulceration or excavation. It is, however, worth the inquiry whether there be not another stage antecedent to the first of these, which might be termed the premonitory, since if such be found to exist, and if it can be recognized, or even conjectured, by any appreciable signs, we may be enabled to apply our remedies at the time at which there is the greatest, or rather, the only, probability of their producing a satisfactory result.

The stage of deposition, which is often regarded as the first, is that in which tubercles are first present in the lungs, and as they are generally considered as essential to phthisis, it may perhaps appear illogical to speak of any previous state of the disease; but setting aside this difficulty as rather formal than real, it must be obvious that since tubercle is itself a pathological epigenesis or morbid product, there must have been some antecedent diseased action, preceding or even causing this product. This previous morbid condition is of a twofold character, the one generally affecting the whole system, constituting what has been already described as the tuberculous diathesis, and the other local, depending often upon a determination of blood to the lungs, or, in other words, upon active congestion of those organs, a condition which is very likely to occur, as already pointed out, at the age when the general development of the system is completed; though it is not denied that in extreme cases of tuberculous diathesis, tubercle *may* be deposited, as a simple perversion of nutrition, and without any appreciable amount of such congestion.

In this first or premonitory stage of phthisis the symptoms are not very marked, and we have often not very distinctive physical signs; still there are often such symptoms preceding those of deposition. These signs are perhaps more of a general and physiological, than of a local and physical character, and are such as might be expected to arise from some embarrassment of the pulmonic circulation, in addition to those of the tuberculous diathesis. Thus there will often be a fixed colour in the cheeks, with a very slight tendency to lividity, there, as well as in the lips; the pulse will generally be quick and small, although the impulse of the heart may be considerable, owing to increased fulness of the right ventricle; the hands and feet will often, from the same cause, be cooler than natural, with sometimes a slight clammy perspiration: the impeded circulation through the lungs, will also affect that through the portal vessels, whence we have some signs of hepatic congestion, as dyspeptic symptoms, and scanty, and often turbid, urine. The respiration, under such circumstances, is generally quickened, though hardly in the same proportion as the pulse, and there is no dyspnœa so long as the patient remains quiet; but the breathing becomes hurried and laborious upon very slight exertion; which also causes palpitation, owing to the blood, when hurried to the right side of the heart, not finding a free passage through the lungs. There is seldom much cough or expectoration in this stage of the disease. These symptoms, it may be observed, are merely those of obstructed pulmonic circulation, which might arise from several causes; but when observed about the time at which phthisis most commonly makes its appearance, they are sufficient to excite apprehension; and if to these there be superadded expectoration of blood in any amount whatever, the grounds for apprehension will be still greater, and the chest should be carefully explored.

Such examination will, at this stage, detect little or no diminution of the natural resonance of the chest; but when there is any it is under the clavicle or in the supra-spinous, and clavicular, regions. There will as yet be no flattening of the ribs beneath the clavicles, but, on the contrary, the affected side may be slightly more prominent than the other; neither is the mobility of the ribs at all impaired. Auscultation, again, declares little that is conclusive. The inspiratory murmur may be good over the whole of the lungs, but the expiratory is too distinctly audible under the clavicles. There may also be a fine mucous rattle in this situation, depending probably on the congested condition of the bronchial membrane in the capillary tubes. The sounds of the heart will be natural over the surface of the organ, which surface, however, seems to occupy a greater space than in health, owing to the fulness of the right ventricle; and, consequently, the præcordial dulness will be increased; there will also sometimes be a soft systolic murmur, depending probably upon the same cause: the cardiac sounds are, however, at this stage of the disease more distinctly audible than in health in other parts of the chest; and this is particularly the case over the apices of the lungs, and arises probably from the increased density of the lung rendering it a better conductor of sound than is the healthy organ; and is the effect of the increased amount of blood in that condition which attends, or immediately precedes, the first deposition of tubercles. This state of the upper lobes of the lungs often gives rise to another phenomenon, which though not constantly present, or at least not always observed, is among the earliest premonitory signs of phthisis; namely, a soft systolic murmur (*bruit de soufflet*) under the clavicles, generally heard about the situation of the bifurcation of the innominata on the right side, and of the subclavian on the left. It is not, however, in all cases so distinctly traceable along the course of the vessel as to be obviously produced by the current of blood through it; and it may be a question whether this murmur is really produced by the lung pressing upon the innominata or subclavian, or whether it be that the pulmonic circulation actually becomes audible owing to the increased vascularity and density of the lung, and thus a sound is produced analogous to the placental souffle.*

In the second stage of phthisis, that of deposition (the first stage of most authors), the *symptoms*, so called to distinguish them from the physical signs, begin more decidedly to manifest themselves. It should, however, be premised, that, as has been correctly stated by Dr. Walshe, these symptoms do not admit of such systematic division, according to the stages of the disease, as do the physical signs. The cough is now almost always present—in a small proportion of cases, dry—but in far the greater number attended with a frothy expectoration, or, what is a more unfavourable symptom, it may have a mucilaginous appearance. The sputa may also be streaked with blood, and even profuse hæmoptysis is not uncommon at this period of the disease; and it is perhaps from its frequently occurring at its very commencement, that an attack of hæmoptysis has often been assigned as the cause of the subsequent phthisis; though it is more correct to regard it as one of the accidents liable to occur in that disease, arising, at this period more especially, from the hyperæmia which exists in the lungs; and although it is to be looked upon with apprehension as a precursor of impending mischief, it may be so far from a cause of that mischief, as to be a means employed by nature for its mitigation.

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* An arterial murmur under the *left* clavicle only was noticed by Dr. Latham in early phthisis.

Dyspnœa is not a more urgent symptom than in the premonitory stage: indeed, in ordinary chronic phthisis it is rarely so at all; the respiration, even upon moderate exertion, never being quickened more, proportionately, than the pulse, rarely so much so.

Pain in the region of the chest, often of an acute, but seldom of a very severe kind, is of common occurrence: these pains may be merely of a neuralgic character, but are more often the effect of partial pleurisies excited by the presence of clusters of tubercles, either on the serous membrane or immediately beneath it.

Febrile symptoms are rarely well developed at this stage of the disease: there is, however, during a great part of the day, an increased heat of the surface, excepting at the extremities, which are generally cold, often clammy, with a tendency to duskiness or lividity: at night, or rather during sleep, there will be an increased, but not excessive perspiration, chiefly affecting the head and chest. The pulse is generally, though not invariably, frequent, small, and compressible; it is, in fact, the pulse of pulmonic congestion (p. 70), though it is, no doubt, accelerated likewise by the nervous irritability almost constantly attendant upon the tuberculous diathesis. Exceptions to this rule no doubt occur, but they will generally be found in subjects in whom there has been some degree of dilatation of the left ventricle, or some other circumstances, modifying the effect of the disturbed circulation through the lungs, upon that of the general system. There may, however, be great differences in the degree of acceleration not only in different individuals, but in the same individual upon different, and even consecutive, days.

It has been stated that the difference between the pulse in the erect and recumbent postures, is less in the early stages of phthisis, than in other diseases attended with debility.

The glandular system in the abdomen will rarely be perfectly healthy in persons of the tuberculous diathesis, and consequently its mucous surfaces will be prone to disorder;

but in addition to this, it is to be observed that one of the first effects of pulmonic obstruction must be venous congestion of the liver, and consequently of the mucous membrane of the stomach and small intestines; uneasiness in the epigastrium, with tenderness below the ensiform cartilage as well as nausea, irregular appetite and occasional vomiting are therefore of frequent occurrence, though the latter may sometimes be induced merely as the mechanical result of fits of coughing. Thirst is rarely absent at this or the subsequent periods of the disease.

The intellectual faculties are rarely much disturbed at this stage of phthisis, except in those cases in which there is also tuberculous deposit in the membranes of the brain, when active delirium may come on at any period. There is, however, in most cases, a good deal of nervous excitement, with restlessness, or irritability of temper.

Emaciation, which is one of the most prominent features of this disease throughout its whole progress, is generally very apparent in this stage, and is greater than can fairly be accounted for, by the vomiting or loss of appetite; so much so, that it has generally been regarded as the direct and necessary consequence of the presence of tubercles, though it would perhaps be more correct to attribute it to that defect or perversion of nutrition of which the deposition of these bodies is one of the results; though it is certain that in many cases in which their presence could not be questioned, not only have the patients ceased to lose flesh when the other symptoms have been for a time arrested, but they have actually increased in weight.

In the female the uterine functions are more or less disturbed in this as well as in the preceding period of the disease; it being by no means uncommon for menorrhagia to be the precursor of the invasion of phthisis: in some subjects, however, there will be a sudden suppression, which is always an unfavourable symptom, since in ordinary amenorrhœa or chlorosis there is generally a gradual diminution of the discharge for several successive periods; neither is it uncommon for its sudden cessation to have been preceded by its excess.

Upon examination of the chest, after the deposition of tubercles has commenced, there will generally be found a slight flattening of the infra-clavicular region of the more affected side. The mobility of the superior ribs, or, to speak more correctly, the expansion of the chest, during inspiration is diminished; these ribs being simply raised, and not gently protruded as in health. The diminished expansion of the apex of the lung is a more important sign in the female than in the male, since in health this expansion is less in the latter than in the former. In some cases the expansive movement is altogether wanting, or there may even be an actual sinking of the infra-clavicular regions during inspiration; this is generally the effect of pleuritic adhesion. The tactile vibration of the voice, is in general absolutely increased in this region; but it should be remembered that it is in health greater on the right side than on the left, and in the male subject than in the female.

There is generally, but not always, in this stage of the disease, diminished resonance on percussion. This may of course be almost invariably at first detected in the infra-clavicular region. It is most marked upon the inner side of this region immediately over the apex of the lung. At the commencement of tuberculization, and when the tubercles may be supposed to be least thickly aggregated, the diminution of the resonance may escape observation when percussion is made upon a single point, though it may be detected by percussing upon a larger surface. The increase in the resonance produced by a full inspiration, which is considerable in health, will be scarcely perceptible where tubercles exist in any considerable numbers. As the deposition and consolidation increase, the sound becomes duller, sometimes so much so as to be even woody. This, however, indicates that there is at the same time agglutination of the surfaces of the pleura. The dulness on percussion is of course most obvious in the infra-clavicular and superior scapular regions; but as the deposition and its consequent changes extend, the dulness does so likewise.

The respiratory sounds are in this stage considerably affected, being in some parts defective, in others increased, and in some tubular or bronchial. They are for the most part attended with mucous rattles; though these are rather to be regarded as one of the accidents than the necessary effects of the disease: and here and there about the parts where the signs of consolidation are most apparent, the dry crepitation from intercurrent pneumonia may not unfrequently be heard. Perhaps the most important sign at this stage is harshness of respiration; though it is doubtful whether it do not belong more to the preceding, since there is good evidence for believing, and the same thing is affirmed pretty confidently by Dr. Stokes, that it may frequently be removed by treatment.

In the third stage, or that of softening, the constitutional symptoms become more decidedly those of considerable suppuration, and we have generally confirmed hectic. There is now a remarkable brightness of the eyes, with pearly conjunctivæ; the tongue is generally red towards the edges, and furred towards the centre; the bowels, too, are irregular, and apt to be disordered by slight causes, and it is probably in this stage that there commences that irritation of the lower part of the ileum and of the large intestines, which terminates in ulceration. The pulse continues frequent, or if it have not been before, it now becomes so; the cough, which may have been but slight, now becomes troublesome, especially in the morning, and there is expectoration of puriform mucus, in which tubercular matter may sometimes be detected: the voice assumes the well-known hoarseness of phthisis: this is by some referred to ulceration near the glottis, but is by others ascribed to a reflex irritation of that part, arising through the medium of the pneumogastric nerve, from the disorganization going on in the substance of the lung. The characteristic symptoms of this stage are, however, the development of the hectic, and the puriform expectoration.

The physical signs of softening, are flattening of the chest, increased dulness, and moist crepitation; the respiration being often tubular, and the resonance of the voice is increased, but there is rarely bronchophony; the impulse of the heart is generally feeble from incipient atrophy of that organ: to this, however, there are exceptions, especially in the more rapid cases. The characteristic sign is the moist crepitation—the mucous crepitation, or muco-crepitant ronchus, of some authors.

In the fourth or last stage, that, namely, of excavation, the constitutional symptoms are still further aggravated; the hectic fever is severe, the emaciation generally extreme: colliquative diarrhœa may be apprehended as the disease draws near to its final termination. The pulse is exceedingly small and frequent, the tongue is red and sometimes dry, the cheeks hollow, and the eyes sunken from the absorption of the fat contained in the orbits. The skin, though it may be at intervals hot and dry, is generally bedewed with a clammy perspiration. It may here again be observed that these symptoms are such as indicate the advanced disorganization of the lungs, and belong to extensive suppurative disease, and, therefore, that they generally occur when the disorganization of the lungs is far advanced; but that they are not invariably absent in the preceding stages of the disease of which we are treating: nor, on the other hand, does it necessarily follow that they will supervene as soon as excavation has commenced; since, in the former case, the tuberculization and consequent softening may have been so extensive and rapid as to give rise to the constitutional symptoms which more commonly belong to the stage of excavation; and, on the other hand, the disease may have been so limited as that a cavity may have formed before extensive softening has taken place elsewhere, and consequently without the hectic and other general disturbance, such as ordinarily belong to that stage of the local disease.

The physical signs of a cavity are increased flattening and diminished mobility. Contrary, however, to what might have been expected, the resonance on percussion is almost always diminished over a cavity: this is generally owing to the consolidated lung which surrounds the excavation as well as the dense adhesions in the corresponding part of the pleura: sometimes, however, when the cavity is large and simple, and near the surface, a pretty sharp stroke elicits a ringing or almost amphoric sound, and now and then a sound is produced resembling that arising from a cracked iron vessel (*bruit de pot felè*); a multilocular cavity on the other hand always diminishes the resonance. The natural respiratory murmur is of course wanting, and in its place may be heard an amphoric sound, like that produced by blowing in a bottle or an empty cask: this sound, commonly called cavernous, has not unfrequently a metallic ring, and the respiration is generally attended by a gurgling sound, like that of air passing through a considerable quantity of liquid. The character of this sound, even in the same cavity, will vary according to the quantity of the fluid which may be present, and may therefore change greatly from day to day, sometimes ceasing altogether, and then returning after a longer or shorter interval.

Such is the general course of the constitutional and physical signs of this disease; but, superadded to them, there frequently arise certain complications affecting either the lungs or other organs, and which may be termed the accidents of phthisis; several of these are of importance as they materially influence the duration of life. One of the first of these, connected with the lungs, is hæmoptysis. This at the very commencement of phthisis has been already shown to be of importance merely as a symptom, and to retard rather than accelerate its progress; but when it takes place after softening has commenced, the hæmorrhage proceeds in all probability from a vessel of some size, which has been opened in the course of the ulceration, and becomes dangerous from its tendency to produce death from asthenia. The extravasation of blood may sometimes take place so rapidly as to obstruct the bronchi and larger tubes, and so cause death from apnœa or suffocation. The hæmorrhage, when it occurs to this alarming extent, is not uncommonly produced by sloughing and gangrene, arising from the strangulation of the nutrient arteries by the pressure of the tubercles. But besides this, gangrene of the lung, when it supervenes in the progress of phthisis, may of itself cause death by asthenia.

The hæmoptysis, sometimes occurs without any previous symptoms; at others, however, it is preceded by a fine moist crepitation and increased sharpness and frequency of the pulse. The symptoms of gangrene will be the same as those with which it is accompanied when it occurs as a primary affection, or as the result of pneumonia (p. 237); but it should be remembered that there may be an intolerable fœtor both of the breath and of the expectoration, towards the close of phthisis, without any gangrene being found after death.

Pneumonia is of such common or rather universal occurrence in phthisis, that it can hardly be regarded as one of the accidents of the disease; unless, as it sometimes happens, it suddenly makes progress from imprudent exposure, change of temperature, or it may be without any assignable cause. Under such circumstances its presence is indicated by increased febrile excitement, pungent heat of skin, crepitation, and the other symptoms which ordinarily attend it: unless, however, it be quickly arrested by the most careful management, it hastens the disorganization of the lung, and consequently the termination of the disease in the ordinary manner. In some cases it has been still more speedily fatal, when a considerable portion of the lung, having been previously blocked up by tubercles, the greater portion of the remainder has been consolidated by the pneumonia, and death from apnœa has been the consequence.

Inflammation of the pleura is so frequent in the progress of phthisis that M. Louis states that he never, in a single instance, inspected the body of a patient who had died of phthisis, in which the lungs were not attached to the ribs by a greater or lesser extent of pleuritic adhesion. These inflammations of the pleura are often associated with tubercles on the surface of that membrane, though it may not be always easy to say, whether the tubercle is the cause of the inflammation, or the inflammation of the tubercle.

These pleurisies are, for the most part, partial, and though for the time they may cause considerable pain to the patient, they are not often attended with the active febrile symptoms of simple pleurisy. They may be early recognized by the pleuritic friction sound, which, however, disappears when adhesion takes place; their occurrence may be regarded as a confirmatory sign of tuberculization of the lungs when, from other circumstances, we have reason to suspect its commencement. Another, and very common affection of the appendages of the lungs in this disease is ulceration of the larnyx; and this, too, is so frequent an accompaniment of phthisis, and so rarely present without it (except in syphilitic cases), that it may be regarded as symptomatic. These ulcers occur mostly in the upper part of the larynx, and often extend to the rima glottidis and the epiglottis, but affect the under surface of the latter much more than the upper. It is a remarkable fact, too, that they are in much greater numbers on that side on which the disease in the lungs is the most extensive: thus it may happen, for instance, that the left lung being extensively disorganized by tubercular disease, and the right comparatively little affected, the left side of the larynx will be found studded with ulcers, and the right almost entirely free from them. Another cause of sudden inflammation of the pleura, in the progress of phthisis, is perforation of that membrane by a vomical cavity ulcerating into it, and the consequent escape of its contents as well as of air into the serous lining of the chest: the effect of this is generally an empyema, with pneumothorax, which is not difficult of detection, and of which the symptoms have been already described. The occurrence of this accident sometimes cuts short the life of the patient by death from exhaustion, owing to the depression caused by sudden inflammation; but if this do not happen, the lung becoming collapsed, and consequently inactive, the disease is for a time arrested, and, if the other lung be but little implicated, life may be prolonged for as long a time as if the perforation had not taken place, or even longer: in a case which occurred to Dr. Houghton, of Dublin, the patient survived thirteen months, and in one related in the 'Guy's Hospital Reports,' as long as three years.

Tuberculous disease in the brain or its membranes sometimes manifests itself in the progress of phthisis; the tubercles being deposited in the arachnoid or on the cerebral surface of the pia mater. The symptoms of this complication may present themselves at any period of the disease, and generally commence with weight across the forehead, which gradually increases to most intense pain over the whole of the cranium, often attended with considerable stupor, but seldom with violent or active delirium; the patient will sometimes look you most steadily in the face when speaking, and then deliberately turn away his head without the slightest expression of displeasure. Tubercular meningitis, when it supervenes under these circumstances, is generally fatal in a few days.

The serous membrane of the abdomen is often the seat of tuberculous deposit in the progress of phthisis; its symptoms are those of chronic peritonitis, to be more particularly noticed hereafter; to ulceration of the bowels allusion has been already made, and also to the diarrhœa which commonly attends it; though this latter symptom may be present when there is no ulceration. Sometimes the ulceration gives rise to perforation, which is followed, of course, by intense peritonitis and speedy death. Sometimes the ulcers cicatrize, and in so doing cause contraction and consequent obstruction.

Another very remarkable, though perhaps practically not very important, abdominal complication is fatty degeneration of the liver: this morbid change does not, however, appear to be nearly so frequent an attendant upon phthisis in this country as the observations of M. Louis show it to be in France. It presents no symptoms, besides an enlargement of the organ and a peculiar satin-like condition of the skin, first noticed by Dr. Addison. Fistula in ano is a frequent occurrence: and its presence in early life should excite a suspicion of a liability to phthisis, if not of the existence of that disease; although it seems, like many other discharges, sometimes to keep the other symptoms in abeyance.

Before proceeding to consider the important questions of the diagnosis, the causes, and the treatment of phthisis in general, it is desirable briefly to notice its rarer form, namely, *acute phthisis*. This disease has been by most authors considered under three forms: the first differing from the chronic merely in its greater rapidity; the second, which is perhaps the most exquisite form of acute phthisis, consists of a universal deposition of the grey semi-transparent tubercles throughout both lungs; and the third presenting crude and softening tubercles throughout both lungs, with here and there small vomicæ.

In the first form we have the same symptoms as in chronic phthisis; but they follow each other with greater rapidity, sometimes running their course in two or three months, or even less. In these cases, however, there is often greater dyspnœa, and a greater tendency to venous congestion, than in the chronic; owing to the emaciation and diminution of the amount of the circulating fluid not keeping pace with the disorganization of the lung, and to the consequent obstruction to the function of respiration, and the pulmonic circulation; there is also a greater liability to pulmonary hæmorrhage from the more rapid ulceration of the lungs, and consequently the less time for the somewhat slow process of obliteration of the vessels which may become implicated; the appearances presented after death are also the same as in chronic phthisis.

In the second form, the lungs are thickly studded throughout with miliary tubercles, the tissue of the organs presenting the appearance of pneumonic engorgement, with here and there consolidation or hepatization. The disease makes its attack with well-marked febrile symptoms, often resembling those of acute and intense bronchitis. In some cases the patients may previously have been in apparently good health; though we shall most commonly learn, upon closer inquiry, that there has been some tendency to phthisis in the family, or even that the patient may have had one or two slight attacks of hæmoptysis, or has been very susceptible to cold; it will generally also be found, where any evidence upon the subject can be ascertained, that the patient has had a quick and small pulse, with some signs of venous congestion.

The final attack, however, generally commences with the ordinary signs of bronchitis; but the dyspnœa rapidly becomes more urgent, the countenance dusky or livid, the pulse very frequent and small, but the impulse of the heart in most cases disproportionately strong. The tongue is furred and much congested; the surface of the body is warm, and often moist, but the extremities are of a clammy coldness. The urine, too, is scanty and high coloured. There is often wandering, but sometimes active, delirium. The symptoms may be summed up as those of extensive bronchitis of the small tubes, with a greater amount of obstruction to the pulmonic circulation than even this disease is sufficient to account for, and fever of a typhoid character. Upon examination of the chest, we may find diminished mobility of the ribs, and perhaps of the diaphragm likewise; but the former appear to remain somewhat elevated, as if inflated, the difficulty seeming to be in expiration rather than inspiration. Percussion generally reveals but little, if any diminution of resonance. Upon auscultation, the sounds heard are commonly preternaturally loud over the whole of the chest. The inspiratory murmur is loud and coarse, with generally a fine mucous rattle, and the expiratory loud and wheezing.

An attack of this kind may prove fatal in a few days: in which case the lungs are found not to collapse, or to do so but little when the chest is opened, and when cut into to be in a state of excessive engorgement, and to be thickly studded throughout with miliary tubercles. The right side of the heart is gorged, and the portion of auricular septum occupied by the foramen ovale, convex towards the left auricle; the liver will also be in a state of hepatic venous congestion.

If, however, the disease do not prove fatal in this stage, it passes on into the third form of acute phthisis, that, namely, of softening tubercles diffused through the substance of the lung. This may, however, present itself without the disease having obviously passed through the previous one, the attack commencing when the patient has been in apparent health. The general symptoms are much the same as in the previous form, but not so rapid in their progress, and the dyspnœa and lividity, though considerable, are less urgent, and the commencement of the febrile symptoms not so strongly marked. The rigors are often repeated for several days, and are generally followed by heat and perspiration; but there will commonly, as in the former case, be a coldness and clamminess of the extremities, with a feeble pulse at the wrist, but considerable impulse of the heart. The cough will generally be attended with expectoration of mucus, which soon becomes opalescent and puriform. Pain will not unfrequently be felt across the epigastrium, and along the margin of the ribs, especially on the right side, caused by engorgement of the liver and spleen from obstructed pulmonic circulation. The urine will be scanty and loaded, and not unfrequently there will be diarrhœa, with tenesmus. Hectic and emaciation now rapidly come on, the expectoration becomes more and more puriform, and the patient dies mainly of exhaustion, but still with a considerable tendency to apnœa, generally within ten or twelve weeks of the commencement of the illness.

Upon exploration of the chest we find that there is slightly-diminished mobility, and the general resonance of the chest is impaired. At the commencement there is dry ronchus, but soon there is fine mucous rattle, which gradually becomes larger, or assumes the character of mucous crepitation, which passes on to gurgling.

Phthisis, it is well known, is a most frequent disease in all climates; but in this more especially. It is also a most fatal one, though not perhaps so certainly or necessarily as is generally believed. The modes in which it proves fatal are various. In the chronic form and when the fatal termination is not hurried on by any of those occurrences which have been spoken of as the accidents of phthisis, the patient dies from asthenia or protracted syncope; owing to the great extent of suppuration in the lungs, aided in most cases by the diarrhœa; just as would be the case from similar disorganization in any other part. Death in this form of the disease rarely, if ever, is the direct result of apnœa, neither do we find in the heart or liver the ordinary results of obstruction to the pulmonic circulation, owing to the volume of the blood being greatly diminished by the protracted suppuration; and accordingly the heart is generally found to be small, and neither ventricle immoderately distended: the liver also is not usually congested. The modes of death from the various accidents of phthisis have been already described. In the acute forms they are altogether different, being more or less owing to the obstruction of the function of the lungs. In the case of rapid excavation the mode of death is less widely different from that in chronic phthisis; there being considerable emaciation and exhaustion; but, nevertheless, urgent dyspnœa, and after death the right side of the heart is distended, and the liver congested. In the case of miliary tubercles, on the other hand, the mode of death is purely apnœa, the patient being often perfectly livid, and there then being every sign after death of the greatest obstruction to the pulmonic circulation, the subject being but little emaciated, or even in full flesh.

The diagnosis of phthisis is, as must be obvious, a matter of the greatest importance, not only as regards treatment: but which is of hardly less moment, when so fatal a malady is in question, as regards prognosis. It must also be apparent that it is of no slight importance to detect the disease at its commencement; though it is at this time that it is the most difficult to do so. It may be that even before its commencement, or at all events before there have been any cough or expectoration, or any of those symptoms which peculiarly belong to it, the question of the danger impending phthisis is submitted to us.

The premonitory symptoms having been already described, it remains to notice a few of the disorders which may be mistaken for early phthisis. The first of these in point of order is, perhaps, dyspepsia, the diagnosis between which and early phthisis, will generally have to be considered only, in persons in whom there is supposed to exist some previous tendency to the latter; and in such subjects, or, in other words, in young adults of phthisical families, or in whom the general symptoms of tuberculous diathesis are present, obstinate dyspepsia is to be watched with anxiety; and if to this there be added a furred and red tongue, not to be accounted for by any transitory febrile disturbance, the danger is greater; or if such a subject, not being a dissipated person, steadily lose flesh without any assignable cause, there is a strong probability of his becoming phthisical.

A most important question arises in young females from amenorrhœa. In ordinary amenorrhœa, or in chlorosis, there is generally a gradual diminution in the menstrual discharge before its entire suppression; in phthisis, on the other hand, the cessation is almost sudden. Still, amenorrhœa has been mistaken for phthisis, and, what is of more serious consequence, the latter for the former; there may be amenorrhœa, with hæmoptysis, without phthisis; but sudden amenorrhœa, with cough, and expectoration streaked with blood, is probably the beginning of phthisis; and if with this there is obstinate bronchitis of one or both apices, the symptoms are still more unfavourable. Closely connected with the above is the diagnosis from hæmoptysis without tubercle; in the female, hæmoptysis with amenorrhœa is more alarming when occurring in small quantities, and mixed with mucus, than when the blood is pure and in larger quantities. In the young adult male, where there is no disease of the heart, or aneurism, if there be hæmoptysis, there is probably phthisis, and the diagnosis becomes almost positive if there be obstinate bronchitis of the upper lobe. Malignant disease of the lung may form an exception, but this is rare in such subjects; and when it is present the character of the expectoration resembling red-currant jelly, as well as the general and local symptoms, will enable us to recognize it.

The discrimination of simple bronchitis from early phthisis is the question that we are perhaps most frequently called upon to decide in regard to the diagnosis of the latter. If to bronchitis of the small tubes there be added diminished mobility of the upper ribs—impaired resonance over the apices—increased loudness of the sounds of the heart in the same situation—irregular or jerking respiration—hæmoptysis—or raucedo—there is probably phthisis, and this probability is still greater if the pulse be persistently more than 100. Emaciation is also an important symptom under these circumstances; but it must be remembered that tubercles and even cavities may be present in the lungs, and the patient recover flesh, when the progress of the disease is merely checked for a time.

Pleurisy has an important bearing upon the diagnosis of phthisis. Frequent attacks of limited and apparently erratic pleurisy are always unfavourable, and still more if subacute or chronic peritonitis be also present. It is stated by Louis, that when the latter disease exists in a person of more than fifteen years of age, provided cancer be not present, there is also phthisis ; to this exception there has been added that of Bright's disease; but even thus qualified, the law, though generally, is not universally, true. Double pleurisy, with effusion, has been stated to be almost certainly indicative of phthisis ; but besides the common exception of Bright's disease, and the rarer ones of malignant disease, and puriform infection, there may be (possibly from rheumatism) double pleurisy with effusion, without phthisis, though almost always in an acute form. Sometimes there is a great depth of solid matter effused on the surface of the pleura : this, when it occurs near the apex, will produce, diminished resonance, tubular breathing, and flattening, which may be supposed to arise from phthisis. This state of things is, however, much more common with the latter affection than without it, and if there be signs of disease in the corresponding part on the other side, though these signs be almost entirely referable to the pleura, the diagnosis of phthisis becomes almost positive.

The diagnosis between phthisis and pneumonia is often difficult, and in many cases we must be satisfied with a merely conjectural one, since pneumonia supervenes upon tubercular disease ; and may be followed by it, if it be not its cause. It is impossible, therefore, as long as pneumonia exists in either apex, to say, that there may not be phthisis; and so much more common is this disease than simple pneumonia in that part of the lung, that the probability is always in favour of phthisis ; though the diagnosis must be considered doubtful, until mucous crepitation or some unequivocal symptom is detected either in the other apex, or in the neighbouring portion of the same lung ; or some of the more characteristic constitutional symptoms make their appearance; or, on the other hand, until the subsidence of the former, and the continued absence of the latter, lead to the belief that the consolidation is dependent upon a disease confined to that part, a conclusion strongly at variance with the apprehension of phthisis.

There may also be a difficulty in the diagnosis between the more advanced stages of phthisis and pneumonia. "If," observes Dr. Addison, "acute pneumonia have already proceeded to complete hepatization, when we first examine the patient, the physical signs are not unfrequently insufficient to distinguish the morbid change from phthisical disease, or from ancient pneumonic induration, with or without dilated bronchial tubes. This is more especially the case when acute pneumonia assails the apex of a lung, which is by no means very uncommon."

It will generally be—by the previous history of the case,—by the disease having come on more slowly and insidiously,—by the greater amount of emaciation,—the greater tendency to hectic,—the less pungent heat of the skin, that we may often be able to distinguish the chronic tuberculous phthisis. The acute phthisis is not so likely to be mistaken for pneumonia of the apex, owing to its more diffused character, except in the case of the first form, in which, no doubt, the difficulty is the greatest; but even here the state of the opposite lung—the character of the fever,—the previous history of the case, will generally enable us to solve the difficulty; still the diagnosis is a difficult one, and the difficulty must be borne in mind, in the treatment of the case, by carefully watching its progress, and the effects of remedies. It is not very often that a question arises between fever and phthisis, still, as was first pointed out by M. Louis, the acute miliary phthisis (form 3) often closely simulates typhus fever of the congestive character; the eruption of fever when it occurs, and is observed, of course decides the question.

When there is chronic peritonitis, if bronchitis, or diminished resonance of the apices, arise, or even if there be increased resonance of the voice, or loudness of the sound of the heart in that situation, there is probably phthisis.

Persistent, or frequently-recurrent diarrhœa is always a premonitory sign, in a young adult, of tuberculous diathesis; and if to this there be added any of the topical signs, the case is almost certainly one of phthisis.*

The treatment of phthisis has generally been considered either as prophylactic or palliative; the former applying chiefly to those cases in which, from family predisposition, or other causes, the disease may be apprehended; the latter to those in which there is satisfactory evidence of its existence: this distinction being based upon the assumption that when the disease is once established, its removal is a thing quite beyond the reach of art.

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* Dr. Walshe's 'Diseases of Lungs and Heart.'

The question as to whether we are to regard the treatment of incipient phthisis as curative, or prophylactic, is of no very great practical value, though it is not entirely without its influence upon our views of the principles according to which the management of the disease is to be conducted. For, if according to the opinions already expressed (p. 292) there must be a lesion antecedent to the deposition of tubercles, we have, at this period, a disease to treat,—and one from which there are good grounds for believing that many have recovered,—and, whether that recovery be regarded as spontaneous, or as the effect of art, it cannot be supposed that it would have taken place under other than favourable circumstances, both external and internal; and, therefore, the rational mode of proceeding must be, to endeavour to ascertain those circumstances, and as far as possible to imitate them: and the same reasoning holds good of the far less frequent instances of recovery in more advanced stages, the cessation of the disease in the manner described (p. 290) being a result more opposed to experience than to any known laws of pathology.

As regards the strictly preventive or prophylactic treatment of phthisis, it consists in measures calculated to prevent the development of the tuberculous diathesis, where it is to be apprehended; and where it exists, to obviate all circumstances tending to promote irritation, excitement, or even undue activity of the respiratory organs; and where such irritation has arisen, to endeavour to subdue it as speedily as possible, without having recourse to such measures, as, by lowering the reparative powers, would favour the general tendency to tuberculous disease.

As to the first of these indications, namely, the preventing the development of the tuberculous diathesis, precautions should be most strictly enjoined for the avoidance of all those circumstances (under our control) which have been already pointed out (pp. 119, *et seq.*) as favouring it, and the cautious use of such means as may be expected to have a contrary tendency.

As to the prevention of the determination of the tuberculous diathesis to the lungs, we must again recur to what has been stated, when treating of the circumstances influencing the location of tubercle (pp. 121, *et seq.*). It is about the age of puberty that the greater expansion of the respiratory organs, arising from a greater need for the activity of their functions, suggests the necessity for increased precaution against their becoming the seat of tubercle; for, although the deaths from phthisis, between the ages of fifteen and twenty, are proportionately much less numerous than those between twenty and twenty-five; there can be little doubt that in the greater number of instances, the disease has its origin during the former period.

It becomes, then, a matter of great importance, in the management of young persons in whom a tendency to phthisis may be apprehended, to use every possible precaution to obviate determination of blood to the lungs, as well as undue excitement of those organs.

In the first place, the obvious and ordinary rules of diet, clothing, air, and exercise, which are, however, but too commonly neglected, cannot be too carefully followed; though, as regards diet, it must of course be nutritious, but not stimulating; taken in moderate quantities, and at reasonable intervals, so as to avoid the extremes of exhaustion and repletion, and to prevent the undue afflux to the digestive organs, and consequent languid circulation in the extremities.

Determination to internal organs, and especially to the lungs, must also be guarded against by a careful attention to the temperature and circulation of the surface. Uniform, but not very warm clothing, is an important means to this end; and it must be used in subservience to the principle of preventing the sudden or too rapid abstraction of the animal heat, but not employed to such an extent as to diminish the activity of those functions upon which the evolution of this heat depends. Light woollen clothing should be employed, in some form, for the whole of the body below the clavicles, and where there is a tendency to irritation about the larynx, a thin layer of flannel or woollen gauze may be worn round the throat: where a uniform system of under-clothing of this kind is adhered to, there will be no occasion for oppressing the body with a load of outer-garments. The same remarks apply to night-covering, though it will not generally be desirable that the patient should sleep in flannel. The night-dress should be calico, and if there is much coldness of the feet, woollen socks may be worn. Before quitting the subject of clothing, we must not omit to notice the mischiefs which may arise from undue pressure or constraint. The apices are the parts first attacked, and, therefore, whatever causes increased activity of that part of the lung, promotes the disease, and this cannot be done more effectually than by compressing the lower lobes by tight stays or waist-bands.

The questions of air and exercise—in the former of which we may, for the sake of brevity, include climate—are at this period particularly important. In the case of a young person in danger of phthisis, whose growth is not completed, we must not only avoid circumstances likely to cause too great determination to the chest, but, as far as we can, prevent such a development of the system as would call for more than an average amount of respiratory function. It is a common observation, that young persons of a phthisical tendency have narrow chests, their lungs not being sufficiently developed ; and, therefore, it is inferred, somewhat hastily, that the narrowness of the chest is the cause, or rather the essence of the phthisical tendency ; the converse, however, is more nearly the truth, namely,—that, when the tendency to tuberculous deposit in the lungs is present, there is an instinctive avoidance of that exercise which would promote the morbid change ; and, therefore, the lungs being less active are less developed. It must be borne in mind, then, that whilst a defective expansion of the lungs is of itself a source of most serious and even fatal lesion, though not of tubercle ; their full or even moderate development, may call the tuberculous diathesis into activity : and, in the management of the class of patients we are now considering, the regulation of air and exercise must be conducted with a view to favouring the gradual expansion of the lungs, without inducing that amount of respiratory function which is excited by a cold atmosphere, and without such vigorous exercise as stimulates the rapid development of the muscular system. With this view, a mild and uniform climate, but, as a general rule, one free from humidity, should be selected ; and for this purpose many parts of the southern shores of this island are well adapted, as Hastings, the West Cliff of Brighton (during the autumnal and winter months), Bournemouth, or Clifton ; though for those in whom, to use the words of Dr. Walshe, there is a greater tendency to the *strictum* in the constitution, Ventnor, Torquay, Budleigh Salterton, Sidmouth, or the coast of Cornwall, as Penzance or Flushing, near Falmouth, and the Cove of Cork, will be better adapted as winter residences. One great advantage of a mild climate is, that there need be less difference in temperature between the external and internal air, and that, consequently, exercise may be taken out of doors, without the risk arising from changes of temperature ; and that such exercise may be sufficient to keep up the warmth of the surface, and excite a moderate action of the lungs, without so far exciting them as to promote the determination of the disease to them. Walking, when it does not embarrass the respiration, is upon the whole the best exercise ; but where the patient's strength is soon exhausted, or where the breathing is easily hurried, riding is to be preferred, provided that it does not cause coldness of the extremities. In warm weather carriage exercise is beneficial, as is also sailing, or being rowed in a boat, where it does not induce sickness.

It is at this period that irreparable injury has often been inflicted by the use, or rather abuse, of athletic games or exercises, pursued sometimes even under medical sanction, from the mistaken notion of obviating the tendency to contraction of the chest, so common in subjects of this class; whereas, from what has been already stated, the expansion of the lungs, and the development of the muscular system, must be most undesirable; and for the same reason the greatest caution is necessary, in allowing the use of such exercises as rowing, cricket, &c., in youths in whom there is a narrow chest and suspected tendency to phthisis; though where this contraction arises from causes to be hereafter noticed, their moderate use is admissible.

Another important question often asked in such cases is, the expediency of bathing. Now where, as it often does, the arterial system seems disproportionately defective as compared with the venous, the pulse being in such cases small and feeble, sea-bathing is seldom safe; as, under such circumstances, there would probably not be sufficient power in the left ventricle to drive the blood again to the surface, and internal congestion, probably of the lungs, would ensue. When, however, as we now assume to be the case, there is no evidence of *present* lesion of the lungs, and the pulse is moderately full, and there are no signs of venous congestion, or of engorgement of the right heart, or other circumstances contra-indicating its use, careful bathing in the sea may be allowed. Such bathing should generally be about an hour and a half after breakfast, and the patient should not remain long in the sea; neither will it be generally desirable that he should plunge suddenly in, but he should step from a machine feet foremost, immerse the whole body and head, and return. He should on no account go cold into the water; but, on the contrary, a slight increase of temperature induced by exercise, is rather desirable. Where bathing is not admissible, sponging the chest both in front and behind with cold water can generally be borne, and where it is followed by a moderate glow it is a most valuable aid in promoting the activity of the circulation in the superficial capillaries.

The period of impending phthisis is, of course, not a time for active *medical treatment*, though it is one for very careful *medical superintendence*. In regard to medicine the same principle must be carried out as in the hygienic management; the general strength and nutrition must be cared for, and undue excitement of the respiratory function guarded against: as a means to these ends attention to the digestive organs is indispensable. With this object in view, it will be necessary, in addition to the careful attention to diet enjoined above, to insure a regular action of the bowels; the irritating purgatives must be avoided; as, besides their other ill effects, they depress and derange the circulation; but an occasional dose of rhubarb and sulphate of potass will be of service: or, if the bowels be habitually costive, a dessert spoonful of olive oil taken early in the morning, will have the effect of relieving them without risk of irritation; or sometimes about half a drachm of the extract of taraxacum taken early will have the same effect. This last has also another advantage, if, as Dr. Baillie used to assert (and as there is reason to believe to be the case), it may be regarded, as a vegetable mercury, exciting the action of the liver; for that organ being, in regard both to circulation and function, closely connected with the lungs, affords a ready channel through which to relieve them. The maintaining the action of those organs which may be regarded as in any way supplementary to the lungs, should never be lost sight of; and as this applies especially to the liver, the state of the stools and urine should be watched; and when the secretion of bile appears defective, it should be promoted, not by mercurials (except sometimes a moderate dose of hydrarg. cum. cret. with rhubarb), but by taraxacum or the laxative just recommended.

Besides the liver and bowels, the kidneys afford a means by which to relieve the circulation of the system generally, and consequently in the chest; and therefore the state of the urine should be regularly observed; and as its becoming turbid will generally depend upon partial obstruction, arising probably from incipient pulmonic congestion, the aperient should be given, and for a time moderate diuretics. The extract of taraxacum with about ten grains of bicarbonate of potass and twenty minims of sp. æth. nit. in bitter infusion, will often have a good effect in this way.

The earliest symptoms of bronchitis, or any other thoracic inflammation, should of course be promptly met by decided, but not over-active treatment; all needless depression of the powers of the system only aggravating the tuberculous tendency. In case of bronchitis, which is the more ordinary form of disease, salines, with small doses of antimonial or ipecacuanha wine, about five grains of extract of conium every night, or night and morning, and, after a few days, the application of a blister, if the irritation continue after the febrile symptoms have subsided, will generally be sufficient. The conium mixture will also be found a most useful medicine under such circumstances. Where pneumonia or pleurisy occur, they must be treated upon the principles already laid down, but with a more cautious use of depletion, and a no less scrupulous one of mercurials. The local abstraction of a very small quantity of blood by cupping or leeches, over the inflamed part, will in either case be often well borne, and expedite the resolution of the inflammation with the least loss of strength to the patient.

Dr. Graves, indeed, as well as several other Irish pathologists, and Dr. Munk in this country, have strongly recommended rapid mercurialization in such cases; but it is not a practice which has extensively obtained the confidence of British physicians.

It is not generally desirable, in the absence of any decided symptoms of disease, to put such patients under a course of medicine. Where, however, there is emaciation, the cod-liver oil, continued for three or four weeks, and resumed, if necessary, about the same time after its discontinuance, may be of service; and where there is an exsanguine appearance, iron, in the form of small doses of the citrate, or of the syrup of the iodide, or the citrate of the quina and iron, should be employed. A very good form for the administration of quina and iron is (F. 33).* The use of iron is often specially applicable to females (it being observed that we are now speaking of young persons just about, or past the age of puberty, in whom there is a tuberculous diathesis, but no apparent pulmonary affection), as the delay or arrest of menstruation is, in young females prone to phthisis, not only an unfavourable symptom, but may be in itself a cause of pulmonic irritation; for the connection elsewhere pointed out, between the uterine functions and the evolution of carbonic acid, renders it highly probable that the suppression of the catamenia must promote the development of tubercle in the lungs.

When a young subject of this class is affected with any strumous ulcer, diseased bone, or fistula in ano, it is doubtful whether the healing of the ulcer is desirable. It is certain that, in some cases, the more active symptoms of phthisis have supervened upon the healing of such ulcers, and have subsided upon their reappearance in the same or some other part. It appears, then, most expedient to use no active measures to heal them, except in so far as that result can be brought about by improving the general health. When, as in case of very unsightly strumous ulceration of the skin, any application is used for that purpose, it would be well to establish some compensating discharge, as an issue or seton on the surface of the chest. The best internal remedy under such circumstances is the iodide of iron. With regard to fistula in ano, experience is strongly opposed to the expediency of the operation for its cure; unless the amount of discharge, and the consequent drain upon the system, be so great as to become almost a greater evil than phthisis.

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* (33) ℞ Quinæ Disulphat. gr. v.—vj.
Tinct. ferri Sesquichlorid. ♏ xx.—ʒ ss.
Acid Hydrochlorici dil. ʒ ss.
Syrupi Rhæad. ℥ii.
Aq. puræ, q. s. ut ft.
Mist. ℥ iv. sumat part 4tam bis vel ter die.

In speaking of the prophylactic management of young persons in whom phthisis may be apprehended, we have said nothing of removal to a distant climate, as it is a question which belongs more to the treatment of the first stage, in which the premonitory symptoms of phthisis begin to show themselves locally: indeed, it may well be doubted whether it is expedient to send young persons in whom the development of the system is incomplete, to an intertropical climate, or even to a low latitude, since it is highly probable that the return to this country would be attended with a double danger.

In the treatment of what we have styled the first stage of phthisis, that, namely, which immediately precedes tuberculization, the principles above laid down must still be acted upon, namely, the averting irritation or inflammation in the lungs, and the maintaining the nutritive powers of the system. Though now that the disease may be said to be impending, if not already existing in the lungs, we lay greater stress upon the former object, and direct our remedies more particularly to these organs.

It is now that the greatest benefit may be hoped for from change of climate; but this change must be made for a sufficient time; and, if a removal to another country be decided upon, it should be to some climate decidedly different from that in which the patient has been hitherto residing. Dr. Graves observes, and with reason, that it is needless to send a patient from these islands to the south of France, or to the Mediterranean;* and that a change beyond the limits of Europe should be made. Madeira is, perhaps, the nearest place, and the convenience of access to that island is certainly a recommendation; but the greatest benefit, probably, is to be obtained by a residence at the Cape or in the West Indies, or by a voyage to India.

It is of the first importance to prevent any inflammation of the lungs or their appendages, and when such does occur it must be treated upon the principles already laid down (p. 308), and any more trifling irritation, as catarrh or slight bronchitis, by light diet, and the conium mixture with a little ipecacuanha wine. When the symptoms, general or local, indicate an increased determination to the lungs, a very small amount of blood may be taken, by leeches or cupping, from under the clavicles, provided there be no tendency to anæmia; or dry cupping may be used. Occasional blisters may also be applied, when there is not too much heat of skin; or the tartar-emetic ointment employed. A valuable method of counter-irritation is the application to the chest of the plaster recommended by the late Dr. Hughes (F. 34).* The pulse in this stage of the disease is generally rapid, and it is important, in some measure, to control the heart's action; for this purpose digitalis will be useful, and the infusion will be the best form for its exhibition; as, although it does not so directly depress the heart's action as the tincture, its more diuretic properties are serviceable (F. 35).†

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* Malaga, however, presents many of the advantages of a more southern climate. See Dr. Francis on 'Change of Climate.'

Where there is no active irritation of the lungs or bronchia, the digitalis may be advantageously combined with iron or quina, or both, as in the pills (F. 36);‡ or it may be added in small quantities to the mixture of quina and iron. Where the quina or steel may be too stimulating, the sulphate of zinc will be found a most useful tonic (F. 37),§ and this more especially in those cases where the skin is generally moist. Another useful medicine will be the conium in combination with sarsaparilla, in the form of the conium mixture, with about fifteen grains of the solid extract, or ʒi. to ʒij. of the liquid.

If there be emaciation, the cod-liver oil will be of service, but otherwise it is rarely so in this stage of the disease.

It is not unfrequently at this period that hæmoptysis occurs, and when it does so, it must be treated accordingly; but it must be borne in mind that when not very great, it is to be regarded rather as a bad symptom than as in itself a cause of mischief, since it is by no means impossible that it may give relief, by diminishing the hyperæmia, which is its cause.

It is rarely, if ever, expedient, under these circumstances, to take blood from the arm, but cupping under the clavicles to two or three ounces is generally admissible. Where it is obvious that one lung is much more affected than the other, that side may be selected; if the pulse be quick, digitalis with acid may be employed, as in (F. 35); and should the hæmorrhage be of such an amount as to become of itself a source of weakness, about ten grains of alum, or five of gallic acid, may be added. Lead has certainly considerable power over hæmorrhage from the lungs, but the other astringents are to be preferred to it when there is much tendency to anæmia. When, however, the hæmorrhage is very great, threatening death from exhaustion, the stronger styptics, as turpentine, may be employed, and cold applied to the surface of the chest. The latter, however, is a remedy to be used with the utmost care, as we have seen more than one instance in which there was too much reason to believe that, by the application of ice to the chest, and the neglect of cautions to prevent the patient being wet with ice-cold water, congestion, pneumonia, and speedy death, were the consequences of over-much zeal in checking hæmoptysis in this manner. When ice is applied, it should be carefully tied up in a bladder, and the effects upon the general temperature of the surface carefully watched.

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* (34) ℞ Emplast. Picis co. ʒ iss.
Anti. Pot. Tart. gr. x.
Solve et misce.

† (35) ℞ Infus. Digitalis, ʒ iij.
Tinct. Hyoscyam. ʒ j.
Sp. Æth. Nit. ʒ iss.
Syrupi Rhæad, ʒ ii.
Acid. Sulph. dil. ʒ ss.
Infus. Rosæ co. ℥ iij. Misce.
Sumat part. 3iam ter die: adde si opus sit. quinæ disulph. gr. j. sing. dos.

‡ (36) ℞ Pulv. Digitalis,
Quinæ Disulph. āā gr. j.
Ferri Sulphat. gr. ss.
Ext. Conii. gr. ii ss. Misce.
Ft. Pil. ter die sumend.

§ (37) ℞ Zinci Sulphatis, gr. i.
Ext. Conii, gr. iv. Misce.
Ft. Pil. ter die sumend.

There is good reason for believing that in many cases of this description, tending, under unfavourable circumstances, to tuberculization and softening of the lung, the disease has been arrested by measures such as we have been recommending, and that, too, in cases where a removal from this country has not been practicable.

The treatment of the two next stages, those, namely, of tuberculization and softening, must be nearly the same, if, indeed, these stages can often be separated; but the object in either case is to allay irritation, and at the same time maintain the powers of the system, and to treat, as they arise, any of the accidents or complications of the disease, which may now be expected to present themselves It will be of great importance to allow the lungs as great a degree of repose as is consistent with the general health, and particularly to preclude all those circumstances, which might be expected to call upon them for any sudden or hurried increase of action. This is mainly to be effected by a uniformly-warm temperature. At the same time, however, in the absence of all the accidents above alluded to, we must not lose sight of the principle of maintaining to the utmost the healthy nutrition of the system. The selection, where it is possible, of such a climate as will allow of the patient passing some time in the open air, or even taking moderate outdoor exercise without incurring any considerable change of temperature, or, indeed, of at any time breathing an atmosphere below 60° F., is a most important means to this end; and, therefore, where the disease is not far advanced, or likely to be very rapid in its progress, a removal to a warmer climate, as the Cape, or to Madeira, may yet be attempted; but it should not be encouraged by the medical attendant without an express intimation to the friends of the patient of the doubtfulness of his living to return; and, therefore, one of the places in this country already alluded to will often be preferred. Even in these, for many months in the year, it will be possible to obtain fresh air without violating the above conditions; and when the external temperature is not below 60°, artificial warming of rooms should be dispensed with, and the windows freely opened. The diet should be nutritious, but unstimulating: mutton, or white fish, or game, being allowed once, and, when there is much debility, twice in the day. The clothing should still be uniform, but not oppressive, and composed of materials that are the worst conductors of heat. As regards medicine, the conium mixture, with the sarsaparilla, or two or three minims of the dilute hydrocyanic acid, will still be found useful, especially if the cough be troublesome, and even at the same time the cod-liver oil may be used, adding to it, as Dr. Walshe recommends, a little mineral acid if it offend the stomach, and, when the bowels are irritable, a few drops of laudanum. It may sometimes be conveniently given, in such cases, floating on the draught (F. 38).* The conium mixture may be given night and morning, and the oil about an hour after each meal. Where the cough is not a troublesome symptom, it will be best to discontinue all medicines except the oil, though it will often be found, after a time, that patients who have been taking it without repugnance, suddenly conceive an unsurmountable antipathy to it; in which case it must of course be withheld: after some time, however, the patient will express a willingness to resume its use, and it will then be found to be as serviceable as before; indeed, the alternation of the conium and sarsaparilla with the cod-liver oil, appears to be a very beneficial course of medicine.

Another important consideration at this period of the disease is the obtaining sleep; indeed, sleep is one of the best remedies in consumption, as it is the most effective and most natural means of giving rest to the respiratory organs.

The extract of hyoscyamus, in combination with that of lettuce, will often be a useful anodyne, but when this fails, opium, or morphia, may be employed (F. 39).* Morphia with henbane is a very useful combination. It ought, perhaps, to have been first stated, that the best of soporifics is fresh air, and that, when the patient can be much out of doors, there will often be no occasion for any other.

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* (38) ℞ Acid Nit. dil. ℳ x.
Tinct. Opii, ℳ iij.
Syrupi Aurant. ℥ i.
Infus. Aurant. co. ℥ vj. Misce.
Ft. haust.

The treatment of the last stage, or that of excavation, can of course be but palliative ; but even here it must be remembered that cases do occur in which there has been a cavity, and that, too, of considerable size ; but where the rest of the lung having been free from disease, the cavity has emptied itself, and ultimately, by the contraction of the lining membrane, been nearly obliterated ; or in which the symptoms, both topical and general, have so closely resembled this state of things, that it has been next to impossible to distinguish them ; so that we are still called upon to omit no precaution to avoid irritation of the lungs, or any means to maintain the nutrition of the system ; for which purpose the same measures must be pursued as heretofore, and to this end the cod-liver oil will still be found most serviceable. A nutritious, but unstimulating system of diet must still be pursued, though where there is much exhaustion the moderate use of wine or malt liquor may be allowed ; of the latter, the best is, perhaps, pure single stout of the London brewers.

When there is any increase of cough or expectoration, the conium with a little ipecacuanha, may be again employed, and counter-irritation may be established over the cavity by a small blister, or the tartar-emetic ointment. It is in this stage that the night-sweats are most troublesome, and against them there is no remedy equal to the combination of zinc and hyoscyamus (F. 40).†

It is often in the latter stages of phthisis that the irritation from the laryngeal ulceration is the most troublesome. Where this is the case, the solution of nitrate of silver should be applied in the manner recommended for chronic laryngitis. Where, however, there is any irritation from this cause in the commencement of the disease, the strong solution may be employed, not only with advantage to the affection of the throat, but apparently with benefit to that of the lungs as well.

The complications, or accidents of phthisis, may be treated upon ordinary principles. The partial and erratic pleurisies which so frequently occur, may be combated by the application of small blisters, occasionally mustard poultices. The intercurrent pneumonias in this disease may be treated upon the principles already laid down, although the details given for the management of active pneumonia would of course be inapplicable here; for we must remember that the pneumonia which we have now to do with is of a disorganizing character, and, therefore, that mercury in considerable quantities, and other lowering measures, should be abstained from. Antimony, where there is much heat of skin, and the bowels are not irritable, may be administered in small doses, and a little Dover's powder and hydrarg. cum cret. given at night, or night and morning. When the inflammation is of a decidedly active character, a few leeches may be applied over the inflamed portion of lung, or two or three ounces of blood removed by cupping. Hæmoptysis, when it occurs, as also pneumothorax, must be treated in the manner already recommended.

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* (39) ℞ Morphiæ Hydrochlor. gr. i.
Ext. Hyoscyami, gr. xvi. Misce.
Ft. Pil. iv. sumat i. h. s.

† (40) ℞ Zinci Sulphat. gr. i.
Ext. Hyoscyam. gr. iv. Misce.
Ft. Pil. om. noct. sumend.

Sickness is often, though not very often, a distressing incident in phthisis: it generally, however, is the effect of some abdominal complication, as strumous disease of the glands about Glisson's capsule; it may frequently be combated by effervescing draughts, to which may be added small doses of prussic acid; or by soda or Seltzer water, given in small quantities at a time; or, where there is much irritability of the mucous membrane, as shown by redness of the tongue, by restricting the patient, for a time at least, to the use of milk and lime-water in about equal proportions, applying at the same time blisters or sinapisms.

Diarrhœa is another very troublesome symptom, and particularly towards the termination of phthisis; it occurs, however, not uncommonly (as we have seen) in the earlier stages, when it is probably excited by irritating matters in the alimentary canal, under which circumstances gentle laxatives may be employed, as castor oil and laudanum, castor oil and tincture of rhubarb (F. 41),* or the combination of rhubarb and chalk and opium (F. 42).† In the latter stages of phthisis, when there is probably ulceration of the bowels, the diarrhœa is best combated by astringents, as copper and opium, compound kino powder, nitrate of silver, logwood, &c. A very useful astringent or tonic is the combination of nitric acid and tincture of opium

* (41) ℞ Olei Ricini
Tinct. Rhei, āā ʒ ij.
Tinct. Opii, ♏ iv.
Aq. Cinnam. ℥ ss. Misce.
Simul agita ft. haust.

† (42) ℞ Pulv. Rhei, gr. xv.
Pulv. Cretæ co. c. Opio, gr. x. Misce.
Ft. Pulv. ex quovis vehiculo idoneo sumend.

(F. 43).* Enemata of starch and laudanum are also applicable. Pain and tenderness in the abdomen, arising from chronic, *i. e.*, tuberculous peritonitis, may occur at any period, though it is sometimes itself the older disease, and with its treatment must be considered hereafter.

We have before spoken of the pneumonic phthisis, in which the excavation of the lung appears to be brought about by the softening of those parts of the organ which had been the subject of pneumonic consolidation: this form of the affection—the pneumonic phthisis of Dr. Addison—appears to be that alluded to by Dr. Graves, under the term scrofulous pneumonia. There is, again, another form of disease which is closely allied to phthisis, and that is the chronic bronchitis, with profuse puriform expectoration, of which also we have before spoken—probably the scrofulous bronchitis of Graves. These affections are to be met with—(1) In those who have inherited no tendency to tuberculosis, but whose constitutions have been impaired by exposure, illness, or irregularities, or by repeated attacks of the acute forms of the above diseases;—(2) In persons of strumous constitutions, but who have escaped the dangers of phthisis in early life, but in whom the tendency again manifests itself, though in this alterèd shape, when their strength has become impaired by age. These forms of disease constitute, in fact, the phthisis of impaired constitutions and of advanced life. The treatment of these affections must be conducted upon the principles already laid down when speaking of pneumonia and bronchitis.

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* (43) ℞ Acid. Nit. dil. ♏ xij.
Tinct. Opii, ♏ v.—x.
Syrupi ʒ i.
Aq. Cinnam. ʒ x. Misce.
Ft. haust. 6ta vel 4ta quâq. horâ sumend.

XVI.

DISEASES OF THE HEART AND ITS APPENDAGES.

Like all serous membranes, the capsule of the heart is liable to inflammation from various causes. This inflammation constitutes pericarditis.

Pericarditis may be acute or chronic: it may be idiopathic, that is to say, arising to all appearance spontaneously, or excited only by the ordinary causes of inflammation; it may also be secondary, that is, the consequence of some anterior disease affecting either the whole system or particular organs.

Acute pericarditis in its perfect form, passes through the stages of engorgement or congestion, effusion of lymph or serum, absorption, and adhesion.

In the first, the surface of the membrane is generally dryer than in health, and if the disease be arrested in this stage (*i. e.*, if resolution takes place), no permanent effect is produced. In the second, the effusion may assume various forms, according as the fibrinous lymph, molecular lymph, or serum predominate. When the effusion consists almost entirely of fibrinous lymph, it is deposited in layers of varying thickness, which often speedily form a bond of union between the cardiac and reflected surfaces of this membrane; though, when very thin, they remain in flakes upon its surface. When the molecular lymph predominates, the solid deposit will be less firm, and there will be (especially if the powers of the system be enfeebled) a tendency to puriform degeneration, pus being sometimes formed in the cavity of the membrane, which produces speedy death by its pressure on the heart; a large quantity of pus being found in the cavity after death, and the surface of the heart covered by soft villous lymph. It more commonly happens, however, that an intermediate condition exists, in which the effusion being but imperfectly plastic, the solid matter is softer than the true fibrinous lymph, and after death the apposed surfaces of the pericardium are found to have been but feebly agglutinated, and present, when separated, a villous appearance; it is this form of effusion, probably, which has been not unaptly compared by Dr. Watson to the rough sides of pieces of tripe, which may be seen in butchers' shops. Sometimes, again, the serum is poured out in large quantities, and if not speedily resorbed, is fatal in the same manner as the puriform effusion; it is, fortunately, much more susceptible of absorption, as it is a much more frequent occurrence.

The next stage is the absorption of the fluid: this often takes place very rapidly, or, what is the same thing, the quantity poured out having been very small, the lymph alone is left, either, giving rise to a greater or less extent of adhesion, or, merely covering portions of the membrane.

The next step in the history of ordinary inflammatory exudations is, the organization of the lymph; and when this is effected without connecting the two surfaces of the pericardium, the membrane becomes in parts roughened by layers of areolar tissue. When the two surfaces are glued together, the organization of the effused lymph takes place with greater or less rapidity, and different effects may be produced on the surface of the heart. There may be simple adhesion, with scarce any areolar tissue between the surfaces, an occurrence which has no doubt given rise to the fables of the pericardium having been found wanting altogether; or, there may be only partial adhesion, or, the fibrinous lymph may have been so thick, that by the contraction which accompanies its organization, it, in a measure, strangulates the heart, and greatly embarrasses the circulation.

It has been a matter of some doubt, whether the fibrinous effusion is ever removed by absorption; that it sometimes is, though after a long interval, and probably through the intervention of fatty degeneration, has been shown by Professor Paget.

The general symptoms of pericarditis, independently of its physical signs, are alone insufficient for the purposes of diagnosis; but so, in some instances, are the physical signs themselves, and therefore neither one or the other are to be disregarded.

The disease sometimes comes on insidiously. Often, in the course of an ordinary attack of acute rheumatism, there may have been no symptoms to mark the origin of pericarditis, yet, upon careful examination, there may be found evidence of changes which would imply a duration of some days: there may have been rigors, but these are by no means necessary: and the pain, in the region of the heart, though a symptom upon which much stress has been laid by several authors, is so often absent when the inflammation is confined to the pericardium, that it may well be questioned, whether in all cases in which it occurs, it is not an accident produced by the pleuritis which so frequently attends this disease, rather than one of its essential symptoms.

When in pericarditis there is pain in the region of the heart, it is generally increased by pressure made upwards against the diaphragm by means of the fingers placed under the margin of the ribs; often there is also a sense of weight or stiffness about the left shoulder, extending down the arm to the elbow or wrist.

Though there may be no pain, there are always in acute pericarditis great distress and anxiety, which are plainly expressed in the shrunken features and contracted countenance; the position, too, is often peculiar; the patient sitting up in his bed with the shoulders bent forwards, and the elbows resting upon the knees, or some other support. Sometimes he will recline upon the left elbow, or against some support placed by the bedside, as he rarely, if ever, lies fairly upon that side, or, indeed, upon either, though he may upon his back.

The occasional presence of orthopnœa has induced some authors to state that its occurrence is a sign of effusion into the pericardium: this is certainly not the case, as it is often wanting when there is effusion; and as often present, and, indeed, urgent, when there can be none; it probably depends more upon the situation and extent of the inflammation, than any other circumstance. As a general rule, the descent of the diaphragm increases the uneasiness, and, therefore, the patient endeavours to place himself in the position most likely to keep it at rest. This is sometimes the case to such an extent, that a patient has been known to tie a belt or bandage round the waist, finding relief by restraining the motion of the diaphragm in this manner; the respiration is almost always hurried, and the alæ nasi expand perceptibly; the number of respirations, too, is increased in a greater proportion than the frequency of the pulse.

The free motion of the heart is no doubt in some degree interfered with, and so far we have the *læsa partis functio*, to aid us in our diagnosis; but as there are so many other disorders that render the heart's action hurried or irregular, no great reliance is to be placed upon this symptom. As a general rule, however, the pulse is frequent, sometimes full and hard at the commencement, but becoming, as the disease advances, feeble, sometimes wiry, and often unequal both in force and rhythm; the frequency of the pulse is also very liable to great and sudden variations, especially upon change of posture, sometimes even from the slightest movement; the tongue is in the more acute and sthenic cases generally covered with a white fur, but it presents no characteristic appearance; there is often, especially in rheumatic cases, a profuse perspiration, and the urine is generally scanty, high-coloured, and loaded with urates.

When effusion has taken place, the action of the heart becomes heaving, the dyspnœa urgent, and the pulse very feeble and irregular.

Another important, though not very common symptom of pericarditis, and one that may occur at any period of the disease, is delirium, which is sometimes of a furious character: this distressing complication is most liable to arise when the cardiac inflammation supervenes upon an attack of acute rheumatism.

The topical signs of pericarditis are, in the majority of instances, pretty distinct, though in some rarer ones they are either altogether wanting, or so feebly marked, that the disease is not easy of detection.

In nearly all cases of this disease, and through all its stages, the mobility of the walls of the chest is obviously diminished, over the region of the heart: in the greater number, the breathing is thoracic, for the reasons already stated; but in some few, in which the inflammation affects mainly or entirely the base of the heart, it may be abdominal.

In the first stage, or that of engorgement, the irritability of the organ being increased, the impulse is most obvious to the eye; and when the hand is placed over the heart, this impulse is felt to be stronger, as well as sharper than in health; the area of the præcordial dulness upon percussion is not increased: auscultation gives a faint friction-sound generally with the first beat, but this is by no means universal.

When the exudation of lymph has commenced, there is not uncommonly a thrill to be felt over the region of the heart, and when the lymph effused is very thick, there is increased præcordial dulness: but the characteristic sign of this stage is the friction-sound, which is produced by the attrition of the surfaces of the pericardium roughened by fresh lymph. This sound is heard with most distinctness when the lymph which causes it, is situated near the base of the heart, and it then commonly accompanies both sounds, constituting the to-and-fro murmur, which can often be traced to the origin of the aorta, but no higher. When the friction-sound is produced more towards the apex of the heart, it is not so constantly double, and generally follows immediately upon the first sound, so as to appear like a continuation of it; it is generally soft in its character, approaching to the bellows murmur, though sometimes it has more of a harsh or rasping tone. It should be remembered that the sounds produced by the attrition of the surface of the pericardium are in themselves morbid or preternatural; and not, as may be the case with valvular murmurs, modifications of the natural sounds; and, therefore, although they may obscure, they do not, as in the case of the latter, supersede them. The natural sounds are therefore still present, though it may be difficult at all times to separate them from the new ones introduced by disease.

Allusion has already been made to the occasional absence or obscurity of the stethoscopic sounds of pericarditis, and this remark is, perhaps, more applicable to the friction-sounds of the stage of exudation; for cases certainly have occurred in which effusion of fresh lymph has been found after death, and in which no friction-sound could be detected during life, though sought for at so short a period before death as to preclude the possibility of effused serum having prevented the friction, and having been subsequently absorbed. In such instances the lymph is of the soft villous character, and the powers of the system and action of the heart have been feeble.

In the case of effusion of fluid, the area of the præcordial dulness is considerably increased, and occupies a triangular space corresponding to the situation of the pericardium; the impulse of the heart, though feeble, is diffused and heaving, and the rhythm sometimes irregular (the pulse at the wrist being very feeble, and often intermitting): an undulating motion may also be sometimes felt by the hand, and some authors mention a protrusion of the intercostal spaces in the præcordial region; though it is doubtful if this ever occurs independently of pleuritis. The apex of the heart is raised higher than its natural position. The sounds are distant and feeble: in most cases the friction-sounds which had been previously heard are observed to have ceased; and where the process of their obliteration has been carefully watched, they will be found to have disappeared from below upwards.

When absorption of the effused fluid takes place, the friction-sounds gradually return, extending, from the base of the heart, downwards towards its apex, and the characteristic signs of effusion gradually disappear. When adhesion is established the friction-sounds are much diminished, and in some cases again disappear altogether, but there often remains a rolling and tumbling motion of the heart. The consideration of further changes in the products of the inflammation belong more to the subject of chronic inflammation of the pericardium.

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The internal, like the external lining of the heart, is liable to inflammation, constituting *endocarditis*, which, like pericarditis, may be either acute or chronic, primary or secondary, and is liable to be excited by the same causes.

The anatomical changes of endocarditis are at the commencement engorgement, with more or less consequent tumefaction of the membrane and subjacent tissues; next effusion of lymph or pure fibrine upon its surface or immediately beneath it; subsequently thickening, granulation, contraction, and puckering:

sometimes adhesion, softening, and laceration. The functional effect throughout, is increased excitability of the organ, with impaired action of its valvular apparatus.

As the effect of the functional derangement we have palpitation and uneasiness at the region of the heart, but not necessarily pain or tenderness in the præcordial region. As the effect of the anatomical changes we have more or less turgescence of the organ itself, with alterations in the sounds accompanying its action, and disturbances in the current of the blood.

The constitutional symptoms of endocarditis differ but little from those of pericarditis. There is much the same anxiety of countenance, but less dyspnœa; the attitude is less constrained, though the patient generally lies on his back; and sometimes there is considerable restlessness: the skin is hot, but not remarkably so, the pulse quick, sometimes unequal or irregular, not intermittent at the commencement of the disease, though the late Dr. J. Taylor stated that it was slow at that period, a remark which applies only to its very beginning.

The anatomical changes, in the heart and the valves, produce corresponding alterations in the physical signs which accompany the movements of this organ, and in its action as an hydraulic machine; in which latter we include the systemic and pulmonic circulations. These changes will best be understood by tracing them from the heart through the system in the different stages of the disease.

In the first stage,—that of hyperæmia or engorgement,—we have more or less turgescence of the organ itself, and this is attended by some increase in the area of the præcordial dulness; the impulse of the heart is at the same time rather duller and more forcible than in health, as well as sharper or quicker. There being as yet merely turgescence of the valves, we have no great amount of imperfection in their action, and therefore, although the sounds accompanying it may be modified, the current of the circulation is not much disturbed: accordingly a valvular murmur may be heard at this period. This murmur, which accompanies the first or systolic beat of the heart, is most distinct in the mid-sternum, and may be traced, along the course of the aorta, nearly to the top of the upper bone: it is produced by the turgescence of the aortic valves, causing them to obstruct the current through the orifice of the aorta more than they do in health. There is also frequently a murmur to be heard, more towards the axilla, in the situation of the mitral valve, also accompanying the first sound. This murmur is generally of the soft blowing character, and is by some authors referred to regurgitation through the mitral valve; the difficulty of this explanation lies in the want of proof that such regurgitation does take place, neither is there any reason for believing it; unless it be owing to imperfect closure of the valve, arising from the action of the columnæ carnæ being impaired by the inflammation of their investing membrane. Others have supposed it to arise from the ventricular surface of the right curtain of the swollen valve disturbing the current of blood towards the aorta, though, if this were true, the murmur would be traceable along the ascending aorta, which it is not. May not the explanation of this murmur, which is a *modification* of the first sound, be found in the consideration that this sound is a complex phenomenon, in the production of which the closure of the auriculo-ventricular valves is not the sole agent, whilst an important one in producing it, namely, the muscular contraction, may be considerably affected? After all, it is probable that the only murmur properly belonging to the first stage of endocarditis is the soft systolic aortic murmur described above. The pulse, as before mentioned, is quick (except, perhaps, at the very commencement of the attack), and its sharpness somewhat increased, but we have as yet none of the conditions of the pulse characteristic of imperfect action of the valves (p. 68); in fact, the absence of such conditions may be cited as additional evidence against the murmur above referred to being produced by mitral regurgitation.

In the second stage, or that of exudation, the lymph may exude either upon the free surface of the endocardium or underneath it: in the former case it is often thrown out upon the ventricular surfaces of the aortic sigmoids, rarely upon those of the pulmonic: being soft, it probably yields to the pressure where the surfaces are apposed in closing the orifice, and, accumulating along the edge of those surfaces, forms a sort of fringe along the margin of the two crescent-shaped segments which constitute the surfaces of apposition; that is to say, along the crescentic margins of the opaque scutiform portion of the valve, or else along the free margin of the valve itself, in the manner described by Dr. Watson. The same thing may occur along the margins of the opposed surfaces of the mitral valve, and sometimes of the bicuspid, though the same exact regularity of arrangement is not observed. These fringes of lymph generally increase either by fresh exudations, or by the deposition upon them of the fibrine from the blood itself, so as to form excrescences of sufficient size to disturb the current passing through the orifices of the heart, and sometimes to prevent the accurate closure of the valves themselves. Similar deposits may also take place upon other parts of the internal surface of the heart, as upon the walls of the cavities, or upon the surfaces of the fleshy columns, or amongst the chordæ tendineæ. It is also a possible, though not very frequent occurrence, that these deposits of fibrine may become detached, and form loose coagula in one of the cavities, generally in the left ventricle; and these are sometimes of sufficient size to cause sudden death by obstructing the orifice, or, undergoing degeneration, to set up pyæmia and its disastrous consequences. But what is, perhaps, a more frequent occurrence, they may be carried onwards into the branches of the systemic circulation, and there is good evidence that such a portion of fibrine (or embolus) sometimes enters and obstructs an artery in the brain, and by cutting off the supply of blood to a part of that organ, induces sudden paralysis.

When the lymph exudes underneath the endocardium, there will ensue an opacity of the membrane, where it lines the cavities, and when between the layers which form the valves, the latter will, in this stage of the disease, be swollen and thickened: thus they may, more than in health, encroach upon the space allowed for the current of the blood, and by their becoming less flexible, the freedom of their action may be impeded. The signs by which these changes may be recognized will be best understood by considering their effects upon, the action of the heart, and, the current of the blood. When there is exudation upon the surface, or between the layers of the aortic valves, there will be more or less narrowing of the orifice, and consequently, upon auscultation, there will be heard the systolic blowing murmur, traceable from the situation of the aortic valves along the course of the artery, as in the first stage of the disease. But it may happen, besides, that the closure of the valve is imperfect, and in this case a murmur, produced by a reflux of blood through the orifice, will be heard in the same situation, but accompanying the second sound. In this stage, therefore, of endocarditis affecting the aortic orifice and its valves, there *may* be a double, or, as it has been called, a *see-saw* murmur. This is not by any means a constant effect, as the murmur may remain a single one in this stage, and even in the next, but when it is present it proves that the disease has gone beyond the first.

Lesion of these valves has, as has been pointed out (p. 69), a characteristic influence upon the pulse at the wrist. When there is simply obstruction, the pulse will be rather sharp, compressible, and of small volume compared to the impulse of the heart; when, however, there is regurgitation through the sigmoid valves, there is the splashing or "water-hammer" pulse.

It has been remarked, and with much reason, by Dr. Chevers (on 'Diseases of the Heart,' p. 17), that it is important to distinguish between effusion upon the surface, and between the layers of the valves. When there is an ordinary systolic aortic murmur with the first sound, but none with the second, the probability is in favour of deposit between the layers of the aortic valves or of small fringes of growths upon the endocardial surface, particularly if this occur early in the disease, and in a subject of previously good health. When, however, the patient is of cachectic constitution, is the subject of visceral disease, or has suffered from previous attacks of rheumatism, fibrinous masses upon the free surface may be expected.

When the exudation takes place upon the surface of the mitral valve, or between its layers, there may occur one or both of two things: the current from the auricle into the ventricle may be obstructed, or there may be regurgitation into the auricle. It is very doubtful whether the former occurrence ever produces a murmur, though some authors have described such; if it do occur, it must just precede the natural first sound; it is, however, to say the least, very rare. When there is regurgitation, there is a murmur accompanying the first sound, and heard more distinctly towards the axilla; but for the reasons already adduced, there is much more obscurity attaching to the sounds ascribed to this valve, than to those of the sigmoids. The pulse, however, affords us great assistance, especially if there be no disease of the aortic valves, which would, of course, materially disguise any character that it would receive from the condition of the mitral; but where these are free, the pulse at the wrist will be either very small, or intermittent, or both, the latter condition belonging more especially to those cases in which the orifice is contracted. And even in cases where there is obvious disease of the aortic valves, the pulse will be much smaller, and less splashing than it would have been had the mitral disease not been present also.

Throughout this stage the constitutional signs of endocardial inflammation continue as before.

In the more advanced stage of the disease are found the changes which ordinarily take place in inflammatory exudations, producing in the valves and orifices of the heart thickening, granulation, contraction, puckering, adhesion, and, sometimes, softening and laceration. These processes seldom present themselves singly; and, therefore, we commonly find the characteristic signs of two or more of them occurring at the same time. To begin with the aortic valves—there may be thickening of the valves, and often with this there will be granulations or warty excrescences on their surface, arising from the organization of the lymph which has been deposited as already described (p. 327); and to these may be added fresh deposits of fibrine from the blood. There will then be increased impulse of the heart (whilst the pulse at the wrist will not be proportionately strong), and a hoarse systolic murmur traceable along the ascending aorta: but in addition to this the effect of the granulations may be to impair the closure of the valves, and cause, in addition to the above signs, a diastolic murmur in the same situation, with a splashing or "water-hammer" pulse.

Again, there may be adhesion between the contiguous extremities or angles of two valves, and with it a tearing away, from their insertions, of the angle, close to which the adhesion takes place; so that the two valves are formed into one imperfect one: or, owing to the contraction of the fibrinous lymph effused between their layers, the valves may become puckered. In either case, there may be present the signs of obstruction combined with those of regurgitation in a much more marked degree than in the earlier stages of the disease.

The same alterations may be produced in the mitral valve, from the progressive changes in the exudation upon the surface of its curtains, or between the folds of endocardium of which they are formed; and we then find the signs of obstruction and regurgitation the same as when the valves are thickened or obstructed in the commencement of the exudation, but, as in the case of the aortic valves, in a more marked degree, both in the sounds of the heart and in the character of the pulse; though it must still be borne in mind that there is a greater obscurity, in the diagnosis of disease of the mitral, than in that of the aortic, valves, arising, as has been pointed out, from the complicated character of the first sound, and from the effect upon the pulse of disease of the former valve, being liable to be modified by that of the latter, as well as simulated by other conditions of the circulation.

There is another effect of inflammation upon the mitral valves which deserves notice, though not of very frequent occurrence, namely,—softening and consequent laceration of the chordæ tendineæ. After death several of these may be found separated, and the extremities shrivelled up upon the free edge of the valve, and covered with clusters of vegetations. The necessary and immediate consequence of this accident is considerable regurgitation into the left auricle, diminished supply to the systemic circulation, and great engorgement of the lungs, causing imminent danger from the combined effects of syncope and apnœa.

The further changes which occur in the lining membrane and orifices of the heart, and the effects upon the extreme circulation and other parts of the system, belong more appropriately to chronic endocarditis and its consequences.

The pathological changes, as well as the immediate effects and symptoms of pericarditis, and of endocarditis, have been separately described to enable the student to analyze more accurately the various cases which present themselves in practice, rather than with the view of describing diseases which often occur in a simple and uncomplicated form, as it is far more common to meet with the two affections combined than with either singly. This will be apparent by considering the causes of pericarditis.

Like pericarditis, endocarditis may arise, to all appearance, spontaneously and as a primary affection, depending upon no assignable cause beyond those of ordinary inflammation; but, like the former, it is more commonly the effect of some antecedent disease.

In estimating the frequency of primary or idiopathic, pericarditis, as well as, endocarditis, some allowance must be made for the chance of both one and the other being overlooked, especially when they do not terminate fatally; still neither of them is probably of frequent occurrence. Of the idiopathic inflammations of the serous membranes, those affecting the heart are less frequent than idiopathic pleuritis or arachnitis, but more so than idiopathic peritonitis; and as regards their frequency relatively to each other, idiopathic pericarditis is more common than idiopathic endocarditis, at least in the acute form.

Both these diseases are, however, almost universally blood diseases, that is to say, arising from some morbid poison, or from retained secretion, in the blood.

Of the former class of causes, by far the most frequent is acute rheumatism. So much is this the case, that we may safely affirm that by far the greater number of cases of *acute* pericarditis, and also of *acute* endocarditis, are rheumatic.

Next to acute rheumatism as a specific disease, acting as a cause of acute pericarditis or endocarditis, is influenza; and next to it, but far less frequent as a cause of cardiac inflammation, is scarlatina; and it is probable that all the eruptive fevers may occasionally induce inflammation of these membranes.

Of the latter class of causes, namely retained secretion, by far the most common is uræmia, from disease of the kidneys, which next to rheumatism is the most frequent of all the causes of acute cardiac inflammation, and is the *most* frequent cause of subacute inflammatory action terminating in organic disease. The same thing may occur, though much more rarely, from retained biliary secretion; and it is not improbable that a large proportion of cases of so-called idiopathic inflammation of either surface of the heart arise from a similar condition of the blood, induced by repression of the cutaneous exhalation.

Such being the causes common to both pericarditis and endocarditis, it might be expected, as, in fact, is ordinarily the case in practice, that the one will almost always be more or less complicated with the other; especially in the more common case of their occurring as secondary diseases; and, therefore, we may speak of them under the common term of carditis as regards their general diagnosis, prognosis, and treatment.

The diagnosis of pericarditis is only to be considered certain, when we have the characteristic friction-sound, of the rather crackling character, which belongs to recent exudation; and this is most distinctly heard when the inflammation involves the base of the heart, and consequently the sound is double. It is very true, as observed by Dr. Walshe, that this friction-sound may be mistaken for others; but it must also be remembered that the sound may be wanting under certain conditions; and then we are left to conjecture the presence of the disease by the previous history, the character of the pulse, the position of the patient, and the diminished mobility of the lower ribs and diaphragm; though nearly the same symptoms would be presented by pleurisy on the left side, confined to the diaphragm. Fortunately, in the acute stages of either disease, the diagnosis between them would be of no practical importance. The diagnosis between pericarditis with a friction-sound, and pleuritis of that part of the membrane which overlaps the heart, will generally be effected by observing the difference between the cardiac and respiratory rhythm; but there is one source of fallacy, in pleuritic friction-sound sometimes affecting a cardiac rhythm: when this is the case, however, the sound is not to be heard over so large an extent of the cardiac region, but is more confined to the edge of that region; the pleural sound, too, is not heard with every beat of the heart, especially when the patient holds his breath.*

The diagnosis of endocarditis, before it has produced the characteristic sounds of valvular disease, is perhaps more doubtful than that of pericarditis; though where these are absent the probability is in favour of the existence of the former disease rather than the latter, particularly if the patient do not exhibit the characteristic attitude and countenance of pericarditis.

There is another form of disease which presents many of the symptoms of both pericarditis and endocarditis, namely, pleuritis on the left side, and nearly confined to that portion of the membrane which is connected with the diaphragm. The diagnosis will, however, soon become clear in the majority of cases, either by the appearance of the friction-sounds or murmurs; or, by their continued absence, rendering it highly probable that there is no cardiac lesion. It is important to bear this distinction in mind, in order to be able more clearly to foresee the subsequent progress of the disease; though as regards the immediate treatment, it is of no great practical moment.

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* Drs. Addison and Walshe.

Neither pericarditis, nor endocarditis, nor the two combined in the more common disease which, for the sake of brevity, we term carditis, is so often fatal in the acute stage, as by the remote effects to which they very frequently lead, the consideration of which belongs more properly to chronic carditis. Death does, however, not very rarely, occur in pericarditis, either from the sudden and rapid effusion of serum or puriform fluid between the surfaces of the membrane, which by its pressure upon the heart produces death from syncope, particularly in pericarditis from diseased kidney and uræmia; or the disease may terminate by asthenia or gradual syncope from the depressing effect upon the heart's action, of the continuance of the inflammation, without any effusion sufficient to account for such a result. This mode of death may also occur, in the manner just mentioned, from endocarditis, as may also sudden syncope from the sudden occlusion of one of the orifices of the left side of the heart, by a coagulum of fibrine, which has formed about the lymph effused upon the inflamed portion of endocardium, and become detached from thence by the current of the blood.

Cardiac inflammation may also prove fatal by exhaustion consequent upon sudden, and often violent, delirium supervening in the course of the disease; sometimes, too, when it appears to be subsiding, and this without a trace of any lesion being found within the cranium. This occurrence is most to be apprehended in rheumatic carditis.

The treatment of carditis will be much the same, whether it affect the external or internal surface of the heart. The great principle of keeping the part affected in perfect rest in all acute inflammations, cannot be applied, except to a very limited extent; still much may be done towards removing all causes of excitement of the circulation, and something towards producing a directly sedative effect upon the heart. With this end, in all cases of cardiac inflammation it is necessary not only to confine the patient strictly to his bed, but to enjoin the most careful avoidance of every movement that can possibly be prevented, a precaution which in cases of this kind is too often neglected, or, rather, not enforced with the earnestness that it deserves.

Another important preventive is the removal, as far as lies in our power, of every mental excitement. Upon this account, as well as of the physical exertion which attends it, no conversation should be allowed; not only should the diet be most strictly antiphlogistic, in the commencement of all acute cases occurring in any but very asthenic conditions of the system; but we should also endeavour, by regulating the quantity of fluid taken, and by maintaining regular and copious discharges from the bowels, the kidneys, and the skin, to render the volume of the circulation as moderate and uniform as possible.

As regards more direct remedial measures, the first question which suggests itself is the expediency of general bleeding. The expectation of thoroughly annihilating an attack of carditis by free and repeated venesection, as recommended by M. Bouillaud, has been long abandoned in this country; both on account of the improbability that where fibrinous exudation has taken place it can be speedily removed; and also because bleeding pushed to such an extent as greatly to retard the movement of the circulation, is not the most likely means of effecting this result. Still it is not impossible, as remarked by Dr. Watson, that, if the general symptoms teach that pericarditis exists, but no attrition-sound is to be heard, we may hope to arrest the disease by a full and copious bleeding. And the same applies to endocarditis, with the qualification that there may exist a faint valvular murmur from the mere vascular turgescence of the valves before any truly inflammatory exudation has taken place. As a general rule, the venesection may be admissible and desirable in the very commencement of inflammation of either surface of the heart, though care must be taken that the absence of the pericardial friction is not attributed to the early period of the disease, when, in reality, it is the effect, of the exudation being of the flocculent, almost puriform character, together with the very feeble action of the heart, both resulting from an asthenic condition.

Unless, however, the indications for bleeding are decided, a safer plan, and not less beneficial, will be the abstraction of a moderate quantity of blood from the region of the heart by cupping or leeches (the former being generally to be preferred): this remedy, though it cannot annihilate the disease after the second stage has been established, will do much towards checking its further progress; and the measure may be repeated without danger to the patient. The next object is to get the patient under the influence of mercury, which will be best effected by the combination of calomel, antimony, and opium, already recommended (F. 3 and 4); the antimony will also fulfil the important indication of depressing the force of the heart's action.

The experience of the author since the publication of the first edition of this work has led him to the conclusion that general bleeding is rarely, if ever expedient, in either pericarditis or endocarditis; the primary or idiopathic form of the disease being very rare. and, when it does occur, being generally of an adynamic character; whilst those which are the result of rheumatism rarely, if ever require it, and will be found more amenable to the treatment appropriate for that disease; and it would be most inexpedient in cardiac inflammation excited by morbid poisons.

When in the course of the disease, or even after its apparent subsidence, effusion appears to be taking place rapidly into the pericardium, a large blister applied to the region of the heart will often have the effect of arresting it.

It has been observed above, that carditis may at almost any period terminate by rapid sinking, and then it may sometimes become necessary to have recourse to stimulants. When the pulse becomes very feeble, the skin cold and clammy, and there are general signs of prostration, especially in an advanced stage of the disease, ammonia, wine, or even brandy may be administered, even although from the probable continuance of the inflammation it may be necessary still to repeat the calomel.

The above remarks apply to the treatment of carditis generally, and more particularly to its simplest, though rarest form, namely, the idiopathic. When, however, it occurs in its more common form of a secondary disease, the treatment must be regulated in great measure by the primary one.

It has been of late a question amongst physicians whether rheumatic carditis should be treated as a common inflammation, or by the means which are found most applicable to the specific one. Till very lately the former has been the plan most generally followed; and perhaps in an acute inflammation, attacking so important a part, it is hardly safe to wait till the secondary disease can be overcome by eradicating the primary one; it becomes, therefore, necessary to direct our treatment immediately to the latter; though it will be most reasonable and generally most successful to select the remedies with some reference to the former. The lemon juice recommended by Dr. Rees, and which is undoubtedly efficacious in acute rheumatism of the joints, is hardly admissible at the same time with the calomel; and therefore it is best to use some other remedy of known efficacy in rheumatic inflammation which can be administered at the same time with the mercurial. When either surface of the heart becomes implicated in the course of an attack of acute rheumatism, apply twelve leeches to the region of the heart, or what is better, let about eight ounces of blood be taken from thence by cupping, and let the patient take the calomel, antimony, and opium; two grains of the former, one of the opium, and a quarter of a grain of the antimony being given to an adult three times a day, and in the intervals let him take the acetate and nitrate of potass (F. 10, p. 147).

When the pulse becomes less sharp a blister may be applied to the region of the heart; and as soon as there is the least effect produced upon the gums by the mercury, the quantity must be diminished, generally to about one grain night and morning, the opium and antimony being administered with it, or else from five to ten grains of the compound ipecacuanha powder, and the acetate and nitrate of potass with about half a drachm of nitric æther, and the same quantity of tincture of hyoscyamus. Digitalis has been recommended on account of its lowering the action of the heart; but in a disease which may terminate suddenly by syncope, it cannot be considered a safe remedy. Colchicum is also used in rheumatic inflammation of the heart; but it is not altogether free from the same objections as digitalis, and the sedative effect of the saline above recommended will in a great measure fulfil the same indication. When, however, a purgative is required, the addition of from twenty to thirty minims of the compound tincture to a senna draught is admissible.

Subsequent experience has, however, led the author to the conclusion that even the topical bleeding is not desirable, and that the treatment should vary little from that of acute rheumatism, with the addition of the application of a blister, and one grain of calomel at night, or night and morning, with the antimony and opium, or with five grains of compound ipecacuanha powder.

It sometimes happens that when the patient appears to be going on favourably, sudden effusion takes place into the pericardium: under such circumstances the application of a large blister will, as in the case of primary pericarditis, often speedily effect its absorption.

When the disease appears to be assuming a subacute form, in which case there is often more or less of subacute rheumatism affecting the joints, the iodide of potassium with liquor potassæ may be administered in infusion of bark, and counter-irritation must be continued by means either of repeated blisters, or the tartar-emetic ointment. The tendency to syncope will sometimes be so great as apparently to require stimulants: these, however, should be cautiously given, the safest, perhaps, being about ten or fifteen minims of sp. æth. co., with twenty of sp. ammon. aromat. The sudden invasion of delirium is a very alarming symptom, and, if not checked, the excitement sometimes terminates by death from exhaustion: this delirium is not generally to be regarded as arising from active inflammation of the brain or its membranes, but appears to be a secondary effect of the cardiac inflammation, occurring when the nervous system is an asthenic condition, and therefore it is best met by opiates and stimulants. There are, no doubt, exceptions to this rule, and therefore caution is requisite in the exhibition of these remedies; and if there be dry skin, scanty urine, or contracted pupil, calomel should be combined with the opium, or when the signs of active irritation of the brain are strongly marked, the opium should be withheld, and the hyoscyamus, camphor, and calomel administered (F. 44).*

When we have to do with pericarditis or endocarditis occurring as a complication of influenza, the leading principle in the treatment of the primary disease, namely, its intolerance of loss of blood, must be kept steadily in view; even the application of any considerable number of leeches will sometimes cause furious delirium, and if the abstraction of blood is attended by no apparent ill effects, or if the inflammation appears to be mitigated, the amendment is, in most instances, only temporary (p. 94). In such cases, a blister should be applied to the region of the heart, calomel, in small quantities, administered in combination with antimony and opium, and in the intervals, acetate of ammonia, to which should be added an excess of the carbonate, as soon as symptoms of exhaustion supervene, which they commonly will in all inflammatory complications of influenza; and, as a general rule, it will be safer to anticipate them. Wine and æther may also become necessary in such cases. Nearly the same rules apply to the treatment of cardiac inflammation occurring as an effect of the scarlatinous poison, though probably the necessity for stimulants will not present itself so early. When urea or bile is retained in the system, we have, especially in the case of the former, a liability to inflammation of the pericardium and endocardium, as well as of all serous membranes. In carditis from uræmia mercury must be sparingly, if at all, used; and, therefore, when the disease arises from this cause, we must have recourse to local bleeding by cupping or leeches—the former, or dry-cupping, being generally to be preferred to blisters, purgatives, and diuretics, the mercury being administered in very small quantities, and immediately withdrawn upon the first appearance of its specific effects.

It may be observed, before quitting the subject of acute inflammation of the surfaces of the heart, that the term carditis has been by some authors restricted to inflammation of the substance, or muscular structure, of the organ, a disease which, though it may be theoretically possible, is one of which we have no experience in its simple form. It is, indeed, highly probable that in the greater number of instances of inflammation, both of the pericardium and endocardium, the underlying muscular structure is involved, the subsequent effects being degeneration, generally in the form of fatty change, which, by diminishing the contractility of the muscular fibre, impedes the action of the organ, and gives a tendency to dilatation.

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* (44) ℞ Hydrarg. chlorid.
Camphoræ, āā gr. j.
Ext. Hyoscyami, gr. iij. Misce.
Ft. Pil. 3^{a} vel 4ta quaq. hora sumend.

When pericarditis assumes a chronic form, there is either a thick layer of fibrinous lymph, or a considerable quantity of fluid in the pericardium, which remains nearly stationary in quantity.

In the former case the solid lymph undergoes various transformations in its progress to organization; during which process there is a liability to fresh attacks of inflammation. When the layer of lymph is thin, there will often, for a length of time, be little or no disturbance of the action of the heart, provided the valves be sound, and the subject an adult; if, on the contrary, the layer of lymph between the two surfaces of the pericardium be very thick, the contraction described in speaking of the consequences of inflammation ensues; and this sometimes to such an extent as almost to cripple or strangulate the heart. The subsequent progress of the disease may be various; in some cases an adhesion and organization may be followed by the deposition of earthy matter. There is a specimen in the museum of Guy's Hospital, where the effused lymph connecting the two surfaces of the pericardium, near the base of the heart, has thus been converted into a bony ring; the patient from whom this preparation was taken having suffered from rheumatism, with, probably, pericarditis, twenty years previously, and having subsequently enjoyed tolerable health until a short time before his death, brought about by ascites, resulting from disease of the liver; which was, to all appearance, primary, rather than the effect of the cardiac affection.

It is also important to bear in mind that after there has once been inflammation of the pericardium, followed by adhesion, the patient is liable to a recurrence of the inflammation upon any fresh attack of rheumatism, though the symptoms will be much masked by the pre-existent disease.

There is scarcely a more difficult diagnosis in the whole range of chest diseases than that of adherent pericardium, where we have not had the advantage of watching the case at the time of the formation of the adhesion. When the adhesion is universal, and the lymph not very thick, the action of the heart will not be much disturbed; there will be no friction-sound, and unless there be hypertrophy, which is a common, though not necessary attendant upon such an affection, there will be no decrease of resonance. When also the adhesion is near or around the base of the heart, the same thing will be the case, though here the beat of the apex will be generally high, and fixedly so.* When the adhesion is near the apex, the beat will be low, and the respiratory movements, of the diaphragm and lower ribs, diminished; and as in this case there will generally be hypertrophy, we shall have the area of the præcordial dulness increased, and a rolling or tumbling action of the heart.

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* Walshe, 'Diseases of Lungs and Heart.'

When, too, as in the last instances, the adhesion is only partial, we may, and generally shall, have a friction-sound; and when there is adherent pericardium associated, as is often the case, with pleural adhesion overlying the heart, depression of the lower part of the sternum, with a dimpling inwards of the scrobiculus cordis.

When the lymph which has glued the surfaces together is near the diaphragm, there will generally be considerable dyspnœa, some flattening of the præcordia, with diminished mobility of the ribs, feeble pulse, orthopnœa, and symptoms affecting the remote circulation, to be hereafter described among the sequelæ of cardiac inflammation.

When a fresh attack of inflammation occurs in a previously adherent pericardium, there will be pain, dyspnœa, and palpitation, with general febrile symptoms: but if the adhesion have been universal, there will be no friction-sound. If, however, there have been partial adhesion, there will often be a soft friction-sound, either single or double, according to the situation; and if there have been old friction-sounds, these will sometimes disappear, owing to the adhesion, which before had been partial, becoming general.

In the rare case of a stationary effusion into the pericardium, we have the same physical symptoms as in the stage of effusion in acute pericarditis, but persistent.

The treatment of chronic pericarditis should consist of very gentle mercurials, as the pil. ipecac. cum scillæ, gr. iv. hydrarg. cum cret. gr. j. night and morning, with iodide of potass, in doses of about two grains three or four times a day, combined with about ten minims of liquor potassæ, and half a drachm of nitric æther. Repeated blisters, or an inunction of tartar-emetic ointment, should also be persevered in.

In regard to the treatment of chronic endocarditis, we would recur to what has been stated at p. 328, respecting the importance of distinguishing between fibrous deposits upon the surface of a valve, and the effusion of lymph between its layers; and the ground of the desirableness of this distinction consists in the greater probability of bringing about the absorption of the latter than the former; and our being therefore justified in pushing our remedies, with that object, to a greater extent in the one case than in the other. These remedies are essentially the same as those just recommended in the case of chronic pericarditis; and it is obvious that, to employ mercurials, however gently, or even iodine, without a reasonable chance of effecting our purpose, must, in such a case, be to waste the strength of the patient. The diagnosis is indeed a difficult one, and also one in which, except in the case of the aortic valves, the physical signs can give us but little assistance;* but even here the general condition of the patient will aid us greatly, since the same state which has been pointed out as contraindicating the use of mercury, is precisely that in which it is most probable the effusion would be in the form of fibrinous masses on the surface of the valves, and, therefore, the remedy powerless in promoting absorption.

The sequelæ of inflammation of either surface of the heart are highly important, as being in their ultimate effects more destructive of life than is the primary disease: the fatal result is, however, in a number of instances, brought about by gradual changes, which are often more obvious in other organs than the heart: in other cases, again, the final and fatal lesion may be in the heart, but not in that part of it which had been the seat of the primary disease, the part least affected having become the most so, as a remote effect, through the intervention of some secondary lesion.

Before proceeding to the consideration of the secondary and remote consequences of cardiac inflammation, or even to that of chronic disease of the heart in any form, it is necessary to premise a few remarks upon hypertrophy and dilatation of that organ.

Hypertrophy of the heart may be true or false.

By true hypertrophy is meant an excessive development of the muscular tissue of the organ. The term false hypertrophy, on the other hand, is here introduced to express an increase in the volume of the heart without a corresponding one in that tissue which constitutes almost its entire substance in health, and upon the strength of which its action depends. This hypertrophy is, therefore, termed false, because it arises, not from an excessive nutrition of the original structure, but from the deposition of a new one in the substance of the organ—a state of things obviously not incompatible with even a deficiency or atrophy of the former.

Dilatation is an enlargement of one or more of the cavities of the heart. When this takes place, without any corresponding increase in the absolute quantities of the muscular walls of the cavity, it is obvious that there must be a corresponding diminution in their thickness. Thus, if we suppose, by way of illustration, that owing to some cause the cavities of the ventricles of the heart were to be increased to twice their longitudinal axes, the proportions to the other dimensions remaining the same; the whole area of the surface of each cavity would be multiplied by four, and consequently (if the quantity of muscular tissue remained the same), its thickness at any part must be changed in the inverse proportion—that is to say, it must be reduced to one quarter. It may here be observed, also, that as the outward pressure, or resistance to contraction, increases in the same proportion as the area of the internal surface—then, supposing the change to take place which has just been assumed, we should have, *cæteris paribus*, four times the resistance with one-fourth the thickness of muscle. In some rare instances it happens that the diminution of the thickness of the walls is seen in a still greater proportion, the actual quantity of muscular structure being diminished. In the majority of cases, however, with the dilatation there is an increase in the absolute quantity of muscle, nearly sufficient to maintain its thickness at the original standard, though not sufficient fully to compensate for the increased size of the cavity. This condition is the most common of all forms of enlargement of the heart, and is generally known as hypertrophy. With dilatation it is also sometimes termed excentric hypertrophy, to distinguish it from what has been termed concentric hypertrophy, in which there is increase in the thickness of the muscular walls without any enlargement of the cavity, or even with a diminution of it from the encroachment of the thickened muscle. It is doubtful, however, if this latter ever really exists during life, its presence having been probably suggested after death by the strong contraction of the hypertrophied muscle.

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* See Dr. Chevers 'On Diseases of the Heart,' in loco citat.

The alone cause of true hypertrophy of the heart is an increase in the force opposed to the contraction of the muscle or any portion of it. This may arise in various ways: thus there may be increased difficulty in the passage of the blood through either the systemic or pulmonic circulation, the effect of abnormal conditions either of the blood, the tissues, or the vessels; or there may be causes of obstruction in the different orifices of the heart, all of which will tend to produce dilatation and hypertrophy—first, in that cavity which lies immediately tergal to it in the course of the circulation, and subsequently in the one lying next behind that, and so on, it may be, to all the cavities of the organ. It is conceivable, again, that a certain portion, or certain layers, of muscular fibre should have their contractile powers destroyed or impaired by disease, and if this be so, it must happen that, a greater stress being thrown upon the remainder, a partial hypertrophy would ensue. Now, we know that other muscles underlying inflamed membranes lose their contractility, as is seen in the bulging of the intercostal spaces in pleuritic effusion, and the distension of the intestines arising from loss of contractility of the circular muscles in enteritis; and therefore it is but reasonable to believe, that there may be loss of contractility of the superficial fibres, and consequent hypertrophy of those nearer the endocardium, as a consequence of pericarditis; and loss of power in the portion of the muscle, underlying the endocardium, and consequent hypertrophy of those nearer the pericardium, as a consequence of inflammation of the former membrane.

The above are not the only modes in which there may be an increase in the force opposed to the contraction of either of the ventricles, giving rise to some form of hypertrophy or dilatation, although there may not be found an obvious mechanical cause for such obstruction. Thus it may not very uncommonly exist in the blood itself, which may be so changed in its physical and chemical or vital properties as not to pass freely through the extreme circulation. Such a state of the blood may arise in disease of the depurative organs, and, when long continued, induces hypertrophy and dilatation. The same condition often produces, or, to say the least, is associated with, thickening and diminished elasticity of the coats of the arteries, extending even to the smaller branches; and thus it may increase the force antagonist to the systole of the left ventricle.

It is not improbable that the physical qualities of the blood may materially influence the facility with which it is transmitted through the capillaries; since it has been ascertained that a fluid which is very thin and perfectly liquid, such as water, does not pass through capillary tubes so easily as one which has been rendered rather viscid by some mucilaginous substance: this may be one reason why blood that has been deprived of a considerable portion of its albumen, as is the case after repeated hæmorrhage or serous discharges, appears to circulate with more difficulty than healthy blood; and why such a condition is often followed by excentric hypertrophy of the heart. It is true, indeed, that with such a state of blood the heart is imperfectly nourished, and this may tend to promote dilatation; but it is a fact, the importance of which is perhaps not sufficiently recognized, that repeated losses of blood, or long-continued serous discharges, or protracted anæmia, are often followed by excentric hypertrophy of the heart.

Muscular exertion is one of the causes which have been assigned for hypertrophy, and there can be no doubt that where strong exercise is habitually used, the heart, like other muscles, becomes more fully nourished: this is perhaps the nearest approach to true concentric hypertrophy that is often met with. When unusual or excessive exercise is persevered in by one not accustomed to it, or in whom the powers of nutrition are feeble, there is obviously a danger of the heart becoming dilated rather than hypertrophic, and, the most common result is excentric hypertrophy; the proportion between the hypertrophy and dilatation varying according to the powers of nutrition of the patient. It is true, indeed, that inordinate exercise endangers the integrity of the valves (though of that more hereafter), but there can be no doubt that when such exertion is used, by one whose muscles are but indifferently developed (as from generally sedentary habits, for instance), a greater or less amount of dilatation may ensue, which may be followed by more or less compensatory hypertrophy. For instance, in London, a medical practitioner, whose mode of life is not that which is most conducive to the perfect nutrition of the muscular tissue, goes through an unusual amount of professional exertion; or a gentleman of the same state of system goes, by way of improving his health, upon a tour on the Continent, or to the lakes of England or Scotland; and finding his health and spirits invigorated, he walks long distances and ascends mountains; he afterwards finds that he is troubled with a little palpitation, and that the action of the heart is at times irregular or intermittent; this is often the effect of dilatation of the left ventricle. The same thing may ensue, from great exertion in hunting, rowing, cricket-playing, by one who is not in "good condition," or even in a young lady of rather anæmic system, or becoming so towards the close of a season, from some more than ordinary fatigue in dancing, or other exciting amusement.

Mental emotion, if violent or long continued, is also reckoned amongst the causes of heart disease, and there can be no doubt that it may, in states of the system above described, produce dilatation, and perhaps hypertrophy.

The above remarks may appear more applicable to the left than to the right side of the heart, but the same principle applies to both: and muscular exertion, which drives the blood onward to the right side of the heart, has no doubt a tendency to produce excentric hypertrophy of its cavities, though the consequence is, in a great measure, obviated by the safety-valve action of the tricuspid valve, explained by the late Mr. T. W. King. The chief cause, however, of enlargement of this side is obstruction to the pulmonic circulation, whether arising from disease or defect of the lungs or air-passages, or of the left side of the heart.

The diagnosis of hypertrophy and dilatation will often follow as a corollary from that of the lesion which has caused it; though at other times it may aid in that of the latter. When there is hypertrophy of the left ventricle, the radial pulse will be full and hard, the impulse of the heart strong and heaving, and the first sound deep. When there is dilatation the pulse will be soft (often sharp, owing to the character of the disease which has produced the dilatation), the impulse of the heart heaving, but not forcible—both sounds loud and sharp. As in both hypertrophy and dilatation there is increased præcordial dulness, the inference will be in favour of one or the other condition, according as the symptoms of either preponderate, always remembering that the most common occurrence is the coincidence of the two. When there is hypertrophy of the right side, the præcordial dulness extends more in that direction, the radial pulse is almost always feeble,—absolutely,—and remarkably so, comparatively to the force of impulse of the heart, which is strong and heaving. There are also signs of venous congestion, with enlarged liver and scanty and high-coloured urine. Hypertrophy of the right heart scarcely ever occurs without dilatation; and the extent of the latter is marked by increased feebleness of pulse, engorgement of the liver, and diminution of urinary secretion.

Of the false hypertrophy, the immediate cause is to be found in fatty change, with so very few exceptions, that we may, for practical purposes, regard this change or degeneration, in one or other of its forms, as constituting the anatomical condition essential to that lesion. In one form of false hypertrophy there is an increase in the volume of the organ (the cavities being enlarged and their parietes thickened); but the latter do not consist of firm muscle, but are flabby and very lacerable, and are discovered, upon closer examination, to be undergoing a process of fatty degeneration. There is a strong probability that in many cases this degeneration is a sequel of inflammation, though it may, no doubt, arise under any other condition of impaired nutritive energy; and as this defect may first show itself in the heart, the lesion may, in one sense, be regarded as primary. Again, it is very probable that some large fatty hearts may previously have been the subject of true hypertrophy, but the increased action necessary to its maintenance has been followed, as its necessary consequence, by a lower grade of nutrition (*i. e.*, fatty degeneration), promoted possibly by a failure of the powers of the system at large.* It is also very conceivable, on the other hand, that fatty degeneration may become the cause of some amount of true hypertrophy, owing to the, as yet, healthy layers becoming more active, in order to compensate for the diminished power of those which have undergone degeneration.

Another form of false hypertrophy is the deposition of fat *upon* the surface of the heart, described by Dr. R. Quain, in an excellent paper upon fatty degeneration of the heart, published in the 33rd volume of the 'Medico-Chirurgical Transactions,' as fatty growth upon the heart. This is generally accompanied by a wasting of the muscular structure of the organ, and, from the weakness caused thereby, with more or less of dilatation. This apparent enlargement of the heart is commonly associated with a general tendency to the deposition of fat in different parts of the system, as the omentum, appendices epiploicæ, &c., and a corresponding defect in the powers of nutrition as regards the muscular fibre.

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* Upon referring to Dr. R. Quain's paper upon this subject, I find that this is one of the explanations given by that author, of the large fatty hearts: and moreover, that he regards it as the most frequent cause of that condition. It may, no doubt, be received as such when there has been any apparent cause for previous hypertrophy.

It is generally difficult to distinguish the consequences of true hypertrophy from those of the previous lesion, of which it is itself the consequence; the hypertrophy being, in fact, a provision for overcoming some obstacle to the performance of a function, essential to the continuance of life, is, in by far the greater number of cases, originally conservative. It may, however, become secondarily destructive, from the injury which the contraction, of a too powerful cavity, may inflict upon parts lying between that cavity, and the seat of the obstruction, which is the cause of the hypertrophy; or even, in some diverging channels of the circulation: or the preternaturally thick and strong walls of the cavity may oppose too great an obstruction to the current from behind, and thus give rise to congestion and hæmorrhage. For instance, disease in the descending aorta may cause hypertrophy of the left ventricle, which, by its preternaturally forcible contraction, may injure the ascending aorta or its valves: again, as the force of the systole of the left ventricle is transmitted equally along all the arterial branches, this hypertrophy, which is merely compensating as regards the descending aorta and its branches, becomes excessive and injurious as regards those arteries which proceed from the arch, especially the carotids and their branches, and the consequence may be, disease, and even rupture, of the vessels of the brain.

The consequences of dilatation are of an almost opposite character; they are, in fact, those of insufficient force in the central-moving power of the circulation. The dilatation and consequent increase of the force opposed to the ventricular systole, with diminution of the force by which that systole is effected, may go on increasing to such a degree that under any (even the slightest) additional exertion or obstruction, death may ensue from sudden failure of the circulation. For instance, a person labouring under dilatation of the left ventricle has, not uncommonly, died of syncope induced by the exertion of getting out of bed or straining at stool, and where the dilatation is mainly of the right ventricle, death from apnœa, or obstructed pulmonic circulation, has been brought on by a slight attack of bronchitis, or even sudden depression of temperature. The more gradual results—obstructed circulation and consequent venous engorgement, are, however, the most frequent effects of dilatation: thus, dilatation of the right ventricle gives rise successively to engorgement of the liver, ascites, and subsequently, to obstruction through the whole venous, and ultimately, the arterial, system; whilst a dilated left ventricle, if the patient is not suddenly cut off by syncope, leads eventually to the same result, by causing obstruction in the lungs, and consequently engorgement of the right ventricle and its results.

The physiological consequences of false hypertrophy or fatty degeneration being essentially those of debility of the heart, are nearly identical with those of dilatation; there is, therefore, the same liability to death by failure of the moving power of the circulation, and perhaps a greater tendency to congestion, from the thickened, though weak cavity not yielding so readily to the distending force from behind, and to irregular action. from its not contracting so readily when distended by the blood.

The diagnosis of true hypertrophy, simply as such, consists in a heaving and strong impulse of the heart, with palpitation upon moderate exertion, a full and hard pulse, which is regular and not frequent, an appearance of congestion of the vessels of the face, giddiness or vertigo, scanty urine, and in many cases torpidity of bowels, amounting almost to constipation. When the hypertrophy, as is most commonly the case, affects mainly the left ventricle, the precordial dulness extends towards the axilla; the impulse of the heart, besides being very forcible, is diffused, the first sound deeper than natural.

In dilatation, there is also dyspnœa, and palpitation upon exertion, with a tendency to syncope; the pulse is sharp, and sometimes full, but always very compressible; in some instances, particularly under exhaustion, intermittent; the countenance is congested, with more or less lividity, in severe cases; and, the extremities cold, sometimes livid, with a clammy moisture: the urine is apt to be scanty and high coloured, and the liver often to be felt below the margin of the ribs. There is extended dulness upon percussion, a diffused and rather heaving but feeble impulse of the heart; the sounds, both first and second, are loud and sharp, but there is not necessarily any murmur with either; though sometimes there is a soft systolic one, the effect probably of distension.

In the more common case of hypertrophy with dilatation or eccentric hypertrophy, the symptoms will be modified according as the greater tendency, to one or the other condition, prevails. There will be dyspnœa with palpitation upon moderate exertion; there will be injection of the countenance and prolabia, with more or less lividity, according to the extent of the dilatation; the urine will be scanty and high coloured, the more so in more advanced cases; the impulse of the heart will be heaving and the pulse will not be proportionably full; the latter may be sharp, but then it will be compressible in proportion to the dilatation. When the dilatation of the left ventricle is considerable, there will sometimes be intermission, increased by whatever diminishes the volume of the circulating fluid, or depresses the nervous powers, as free purgation or diuresis ; the tendency to syncope will also depend upon the extent of dilatation ; in severe cases there is also orthopnœa ; there will be extended precordial dulness, and the impulse of the heart will be diffused and heaving, but not forcible unless there is thickening of the muscular walls. The first sound will be loud—dull when there is much thickening—sharp in proportion as the walls are thin. There is not necessarily any abnormal sound, though there is sometimes a soft systolic murmur (distension murmur) ; and there may be slight murmur, with the second sound, in old cases where long-continued distension has caused some degree of attrition, and consequent opacity and thickening.

The diagnosis of false hypertrophy, or enlargement with fatty degeneration, will depend much upon the general aspect and condition of the patient : it is more common in advanced life than in early manhood ; but to this the exceptions are not very rare ; and young females in whom there is a tendency to obesity are liable to it. In early life it is certainly more common in the female than the male ; it is also observed most frequently in those who are disposed to be fat, and in whom there is a degree of sallowness, with a silky and sometimes unctuous condition of the surface ; the minute veins over the whole surface are often injected ; it is perhaps more common in those who live in large towns and pursue their callings in a confined and impure atmosphere than in those who live in the country, and are much in the open air. The symptoms are thus described in the paper of Dr. R. Quain before alluded to : "A patient complains in the earliest stages of being exhausted, particularly by ascending heights ; he feels, he says, faint when he gets to the top of the stairs ; though not giddy, he feels as if he must fall ; and though not breathless or panting, sighs and seeks for air." Any unusual excitement, a heated or close atmosphere, produces the same effects, at the same time there is often experienced an uncomfortable feeling of choking or fulness in the chest. In the intervals the individual is pretty well. As the disease advances, the attacks become more frequent and severe, and often disturb and distress the patient at night ; the temper has been observed to be irritable ; in several cases the expression of the features appears anxious, and frequently the countenance is sallow ; œdema of the legs and copious perspirations from very slight causes appear amongst the associates of the disease ; the pulse is generally affected, but the mode in which it is so depends, no doubt, on the part of the heart which is implicated, and on the extent and degree of the disease. Irregularity is one of the most frequent alterations, weakness is another, slowness a third. "In general, weakness, irregularity, and slowness of the pulse are the characters which we most frequently find." As the disease advances the symptoms become more marked, the various effects of languid and feeble circulation show themselves, angina pectoris is perhaps fully developed, or the patient is cut off suddenly by some of the effects connected either immediately or remotely with the lesion itself.

The physical signs are, extended precordial dulness when (as is generally the case) the heart is enlarged, a very feeble, though sometimes diffused impulse of the heart, the first sound very feeble : it is doubtful if any murmur is necessarily present ; when a systolic murmur is heard it is probably the effect of distension. In two out of eighty-three cases in Dr. Quain's paper, the second sound was feeble or imperfect ; this was ascribed by him to fulness and dilatation of the ventricle preventing perfect closure of the semilunar valves.

As regards the treatment of simple or primary hypertrophy, it is, as has been shown, so rare a disease that it will seldom, if ever, be necessary to direct our remedies especially to it. The cases which approach most nearly to this form of hypertrophy, are those in which there is a tendency to an excessive development of the muscular system, increased, it may be, by great muscular exercise ; the danger being that either the valves or the arteries will be injured by the too forcible contractions of the ventricle. The obvious indications in this case are the avoidance of the causes which may have led to the hypertrophy, and the use of a moderate unstimulating diet. Diuretics, with alkalis or alkaline carbonates, may be occasionally employed, and all tendency to congestion counteracted by maintaining a steady and rather free action of the bowels. It is only, however, in extreme cases, as when, for instance, there is reason to apprehend hyperæmia of the brain, that bleeding is to be resorted to ; since whatever impairs the nutrition of the body may favour fatty degeneration, which is probably one of the remote consequences of hypertrophy.

The treatment of the false hypertrophy, or fatty change of the heart, can be little more than prophylactic, since as Dr. R. Quain very justly observes, "We have no evidence to show that we can restore muscular fibres which have been destroyed : all, therefore, that we can hope for, and that not always, is to arrest, or suspend for a time, the progress of the disease by improving the quality of the blood, and thus supporting the vigour of those portions of the heart still uninjured." Nevertheless there is good reason for believing that, in cases not very far advanced, much may be effected by measures of this description; and by so regulating the circulation as to prevent all unusual distension of any of the cavities of the heart. When a tendency to this disease exists in young subjects, a mode of treatment, such as would be applicable in cases of obesity, must be pursued; accordingly a spare diet of lean meat, and a moderate allowance of bread or biscuit, but little vegetables, and no fermented liquors; active exercise being at the same time perseveringly followed, much after the plan recommended by Dr. T. K. Chambers; liquor potassæ may be taken in milk, in doses from half a drachm to a drachm; and, above all things, a pure bracing atmosphere should be sought. In this manner great relief has been obtained in several instances which have occurred to the author.

The greatest danger from this disease, however, arises in more advanced life, when active exercise cannot be borne, owing to the general weakness, and when any considerable exertion, by hurrying the blood to the heart, might involve the danger of over-distension of that organ; but even under these circumstances we may gain much from a system of diet similar to that which has been recommended above; and we may hope for equal benefit from a pure atmosphere, since this form of degeneration is much accelerated, if not induced, by the want of that essential depurating agent, without a sufficient supply of which, the consumption of the redundant carbon in the extreme circulation, and the excretion of the carbonaceous compounds by the lungs, cannot proceed. The liver, it is true, may often, under these circumstances, be stimulated to supply, to a limited extent, the defect of the action of the lungs, and so may also the skin: these ends may be promoted by the frequent use of aperients, which must not be of a depressing character; for instance, the compound decoction of aloes with the addition of a few grains of rhubarb and acetate or tartrate of potass (F. 45):* should this draught not prove sufficiently active, its use may be preceded by some colocynth pills with calomel. The liquor potassæ and extract of taraxacum may also be administered in these cases alternately with saline diaphoretics. These measures, however, can be regarded only as palliative, and as from the debility of the heart there is a tendency to engorgement of the liver, the difficulty of maintaining a free action of that organ will generally increase. Some relief may also be given to the pulmonic circulation, and through it to the right side of the heart and the liver, by expectorants, which should generally be rather of a stimulating character, such as the combination of squills and ammonia.

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* (45) ℞ Pulv. Rhei. gr. xii.
Pot. Tart. ʒ ij.
Decoct. Aloes co. ℥ ss.
Sp. Ammon. arom. ♏ xx.
Aq. Pimentæ ʒ vj. Misce.
Ft. Haust. mane sumend. Or,

℞ Sodæ bicarb.
Pulv. Rhei. āā gr. xii.
Decoct. Aloes co. ℥ ss.
Aq. Pimentæ ʒ vj. Misce.
Ft. Haust.

The great object, however, being, if possible, to arrest the tendency to fatty change, the chief reliance must still be placed (in conjunction with a rigid adherence to the prescribed regimen) upon such exercise as can be taken (without inducing palpitation or faintness) in the open air, in the country, or by the sea-side. Where the patient is able to ride, gentle horse-exercise will be most desirable; otherwise he should drive in an open carriage, or walk moderately.

Before proceeding to consider the treatment of the more common cases of hypertrophy with dilatation, it will be well to trace the effects of its most frequent cause, namely, lesion of the orifices, producing either regurgitation, or obstructions, or both; as we then shall be in a position to take a more rational view of the management of chronic disease of the heart in general. Now, as has been remarked, the essential cause of hypertrophy, of any portion of the muscular tissue of the heart, is an increased stress thrown upon those fibres; and as among the most frequent causes of such increase is obstruction in the orifices, or defect in the valves, we will commence with the ventriculo-aörtic orifice.

When there is thickening of the valves and contraction of the orifice of the aorta, it is obvious that there must be an increase in the resistance to the exit of the blood, and consequently that hypertrophy of the left ventricle with dilatation may be expected to ensue; and such is almost always the case; but it may not be at first so obvious that the same result will follow regurgitation through these valves with little or no obstruction. Supposing that the orifice is clear, but that the valves remain open, there will be a full jet into the aorta, but as soon as the systole is complete, a portion of the blood will return into the ventricle, which is in the mean time receiving fresh blood from the auricle, and thus becomes over-distended, and called upon for an increased amount of contractile effort. Having, in fact, besides maintaining the systemic circulation, to keep up a to-and-fro motion of a certain quantity of blood, which is continually passing backwards and forwards through the valves (without, as it were, the pale of the circulation), the left ventricle must either become hypertrophic, to sustain this additional effort, or must yield under it, and become dilated.

When the impediment to the circulation is not very great, and the hypertrophy is nearly sufficient to compensate for the increased difficulty, the patient may live for months and years under favourable circumstances, with comparatively but little inconvenience. When, however, the dilatation continues to increase in a greater proportion than the hypertrophy; or, which is the same thing, when there is not hypertrophy sufficient to prevent the dilatation, it happens either—that the patient dies suddenly from syncope, or—that owing to the inability of the left ventricle to empty itself, there is an obstruction to the entrance of blood into it from the auricle, and the effect is engorgement of the lungs and the right side of the heart, engorgement of the liver, ascites, anasarca, and death from apnœa, in the manner to be presently described, as occurring in disease of the mitral valve.

The symptoms of lesion of these valves have been already pointed out; but it may be here remarked, that as long as there is no other disease obstructing the circulation, the pulse, though splashing, or having the other characteristic conditions, continues regular: but if any cause arise to obstruct the pulmonic circulation, as, for instance, an attack of bronchitis; then it will become irregular, for the reason that the cavity of the ventricle being enlarged by dilatation, the diminished supply of blood will not be sufficient to stimulate it to regular contraction.

When there is chronic change in the left auriculo-ventricular orifice, the effect upon the circulation will differ little, whether that change takes place in the way of thickening of the valves and contraction of the orifice, or of imperfect closure, arising either—from puckering of the valves,—from vegetations upon their edges,—from rupture of the chordæ tendinæ,—from dilatation of the ventricle drawing away the origins of the columnæ carnæ, or—from dilatation of the orifice itself. The immediate effects, however, upon the heart will be somewhat different; if, for instance, there be contraction of the orifice, the current of blood into the ventricle being small, it will be but feebly excited to contract, and owing to this comparative inactivity, the cavity will be small, and the walls rather thin; and since the current into the ventricle is small, that which flows from it must be so likewise; and, if there be no other counteracting disease, the aorta will be small also; since, as has been already explained (p. 30), the size of an artery is regulated by that of the current of blood passing through it. This state of things does not, perhaps, always continue, as owing to the obstruction being propagated backwards through the pulmonic and venous systems, it at length reaches the left ventricle, which then begins to dilate, and becomes more or less hypertrophic.

When there is regurgitation through the mitral valve, the orifice being not contracted; or, as is not uncommonly the case, being dilated, there will not be the same want of stimulus to the left ventricle, which will then be, not diminished, or what is more likely even increased, in capacity and thickness.

The effect upon the pulse will, in either case, be nearly the same, as it will be frequent, very small, and often intermitting: as a general rule, if there be intermission, the lesion of the mitral valve is, probably, contraction, rather than regurgitation.

The most serious consequences of this lesion, however, take place in the direction opposite to the course of the circulation. The first result is dilatation of the left auricle, which sometimes becomes so much enlarged as to press upon and flatten the left bronchus; not, indeed, so as materially to embarrass the respiration, but sometimes sufficiently to cause a bronchial respiration to be heard in that situation. Whether this sound can be made available for diagnosis is, at present, questionable. From the left auricle, the obstruction extends to the pulmonic veins and arteries, causing great delay in the circulation through the lungs, and thereby preventing the aëration of the blood, and giving rise to general venous congestion, with lividity of the lips, cheeks, and extremities. The bronchial membrane also becomes much congested, and the capillary circulation is sometimes relieved by the effusion of serum into the cells and bronchial tubes: this, sometimes, occurs to such an extent as to become dangerous, by threatening death from apnœa.

From the lungs the obstruction extends to the right ventricle and auricle, producing, in the first instance, over-distension of the former; this, however, brings the safety-valve action of the tricuspid valve into play, thereby allowing much of the blood to be thrown back into the former, and delaying and diminishing the engorgement of the lungs that would otherwise speedily ensue. It has been suggested by Dr. Chevers, in one of a most interesting series of papers originally published in the 'London Medical Gazette,' that the venous circulation may also sometimes be relieved by the bronchial artery taking on the functions of a vein, though this can hardly be expected to happen, except in young subjects. The next sequence of the obstruction is engorgement of the right auricle, which is closely followed by accumulation in the great reservoirs, the liver and spleen. In the former of these, hepatic venous congestion takes place, and the organ becomes rapidly enlarged. This is followed by portal congestion, and engorgement of the veins, converging to form the vena porta, and hyperæmia of the gastro-intestinal mucous membrane, which often give rise to much irritability of the stomach, and sometimes to diarrhœa: from the same cause ascites is also produced, whilst the congestion of the systemic veins produces general anasarca. The disease, sooner or later, ends fatally by apnœa, either from the direct effect upon the lungs, or from that cause aided by the pressure upon the diaphragm, arising from the enlargement of the liver, and the accumulation of fluid in the abdomen.

Such is the least speedy termination of this most serious lesion of the heart, though it may prove fatal at any period, either in the manner above pointed out—by a very extensive pulmonary apoplexy,—by a combination of apnœa and syncope, arising from inability of the right ventricle to propel the accumulated blood by which it is distended,—or, it may be, by coma, the effect of venous congestion in the brain.

As regards the diagnosis of lesion of the valves of the left side of the heart, there is no great difficulty, in the earlier stages especially, in distinguishing between disease of the aortic, and that of the mitral valve, though there is often much, in distinguishing the latter from other affections of the pulmonic circulation. Before the obstruction produced by disease of the aortic valves has extended far back along the course of the circulation, there will be little general distress, and the patient may be scarcely aware that he is labouring under any disorder of importance. It is, then, only to be recognized by the characteristic murmur traceable along the course of the ascending aorta, and by the almost equally characteristic pulse (p. 68). In the more advanced stages, when the effects upon the circulation more closely resemble those arising from disease of the mitral valve, the same means of diagnosis will distinguish between this and any other cardiac lesion; except, perhaps, disease of the ascending aorta itself.

When there is disease of the mitral valve, whether obstructive or regurgitant, the earliest symptoms will be those of obstruction to the circulation through the lungs, which may sometimes be so great as to give rise to hæmoptysis: this, with the very small, or intermittent, pulse, will be sufficient to direct attention to the investigation of the condition of the organs concerned in the pulmonic circulation; and, if to these symptoms there be added those of venous obstruction already described, there can be little doubt of the existence of disease in some portion of this circuit; and if there be, besides, a bellows murmur with the first sound, increasing in distinctness towards the axilla, the probability of disease of the mitral valve will be further increased; and this murmur will generally indicate regurgitation.

Narrowing of the orifice of the mitral valve is also generally attended with a systolic murmur, though this murmur is rather more to the right than in the case of regurgitation, that is to say, a little to the left of the origin of the aorta: this latter murmur may be distinguished from that of disease of the valves of the aorta, by its not following the course of that vessel. The presence or absence of these murmurs is not, however, to be regarded as deciding the question of the presence or absence of disease of the mitral valve, since their *immediate* connection with such disease is, to say the least, doubtful.

The prognosis of valvular disease of the heart may be inferred from what has been said of its ordinary progress—it is, in the main, unfavourable; at the same time, it must have been apparent, that there is a great difference between the rapidity with which a fatal termination may ensue in one form of disease, or in another. Thus the prognosis is at first much less unfavourable in disease of the aortic valves than in that of the mitral.

When there is evidence solely of disease of the aortic valves, as obtained by the state of the pulse, and the stethoscopic signs, we may reasonably hope that, under careful management, life may be prolonged in comfort for many years; and in the case of young persons, we may even go further, and, judging from experience, assert that it is at least possible that the injury may be so far repaired, or the state of the orifice may be so adapted to the condition of the valves, that a considerable degree of vigour and activity may be maintained, and the patient grow up to perform the duties of any but a very laborious station in life.

Disease of the mitral valve, on the other hand, leads to death, as it were, by a shorter route; though, even here, much may be done to delay its termination, when the narrowing or regurgitation, and consequent pulmonic obstruction, are not very great. In women, too, the establishment and maintenance of the catamenial discharge may afford great relief, though a fatal termination may be apprehended when this function ceases.

It has been pointed out, however, that there is much obscurity about the state of the mitral valve, when the sigmoids also are diseased; and therefore we must be guided rather by the effects upon the circulation generally, particularly upon that through the right heart, than by any stethoscopic signs of the local affection. As a general rule, therefore, when we have the signs merely of disease, whether obstructive or regurgitant, of the aortic valves, and no evidence of obstructed circulation elsewhere,—without dyspnœa, venous congestion, or scanty urine,—our prognosis, though not favourable as regards the ultimate result, may be such as to give a hope of years of comfort and usefulness. But where there are signs of obstructed pulmonic circulation, engorgement of the liver, or scanty urine, we must apprehend, either—that the obstruction caused by the disease at the orifice of the aorta is extending itself to the left auricle and the lungs—or that mitral disease exists, though masked by that of the aorta; and in this case the prognosis is bad. Disease of the mitral, again, is essentially unfavourable; but even here we must judge rather by its results than by the topical proofs of its existence; and when the pulmonic circulation remains tolerably free, and there is but little or no, dyspnœa, lividity, or œdema, and the urine is not very scanty, we must not entirely destroy the hopes of the patient and his friends.

The general principles of the treatment of the sequelæ of inflammation of the heart, whether of the pericardium, the muscular tissue, or the endocardium, follow pretty directly from the explanation which has been given of their origin and tendency to a fatal result. The first indication in the treatment of such disease is to prevent, if possible, any further injury being inflicted upon the weakened structure by the forcible action of the ventricle, the next to counteract that tendency to excessive dilatation which is one of the steps leading to a fatal issue, and, the last, where this dilatation has become such as to impair materially the moving power, to obviate the effects of such weakness, whether manifesting itself in the form, of tendency to syncope, or, of venous congestion.

In applying these principles to the aortic orifice and its valves, we may remark that the most frequent cause of disease of this orifice is endocarditis, and of that endocarditis, the most frequent cause is rheumatism, and next to it, uræmia, as occurs in albuminuria, in addition to which various morbid poisons, as those of scarlatina, influenza, &c., may produce the same effect; but besides these, excessive muscular effort may give rise to a local endocarditis, which causes thickening or adhesion of the valves, or, when very great, to mechanical injury in the way of laceration or retroversion. Exertion of the arms, especially when raised above the head, as in the case of sawyers and sailors, and when violent or long sustained, as in rowing, is apt to produce the same injury. It is to be remembered, however, that such efforts are more especially dangerous to those who are not in the habit of making them. Thus a gentleman runs a much greater risk by a rowing match than does a waterman. Mental emotion is another cause, and to these may be added excesses of all kinds, as at once exciting and debilitating.

Whenever, then, we have reason to suspect that there has been at any time endocarditis (and the very fact of a previous attack of rheumatism should arouse such a suspicion), we should lay down the strictest injunctions for the avoidance of all these exciting causes, and the necessity for such restrictions becomes tenfold, when we have the slightest auscultatory sign of any lesion of the valves. It may be said, indeed, that in regard to mental emotion, but little can be done; yet where we have to do with young subjects, and such cases are not uncommon, we may explain to parents the possibility of acquiring or confirming habits of self-possession, which will do much to counteract the effects of external circumstances in exciting mental emotion; and in all we can enjoin the necessity for avoiding scenes and places where they are likely to be exposed to such excitement.

In arresting further injury to these valves, much is to be done by dietetics. The diet should be carefully regulated as to quantity and quality, of both solids and liquids. As regards food, it should be nutritious, unstimulating, and not great in point of bulk. Thus a moderate meal of meat should be allowed once a day, and with it about half a pint of liquid; this may be either light malt liquor, as bitter beer or ale, or water, with a glass or two of wine, according to the habit and general condition of the patient. For breakfast, cocoa where it agrees, will be a good beverage, or otherwise, "café au lait;" both these are to be preferred to tea, but of none should more than half a pint be taken; an early dinner, about four hours after breakfast, is generally to be preferred, and about four hours after that, a little tea (not more than two *tea-cups*), and at night a very light supper, as a small basin of arrow-root, sago, or tapioca, or a sandwich, with a little wine and water, where there is any tendency to exhaustion; but, except during sleep, nourishment should be taken at intervals of about four hours. Exercise must be regulated upon the same principles; walking, but not against any steep ascent, and gentle riding, as being conducive to healthy nutrition, serve to obviate the tendency to dilatation; always provided that they are neither attended or followed by uncomfortable palpitation. A pure and moderately-bracing air is also desirable, and upon much the same grounds. Cold bathing is inadmissible, but where the affection is but slight, tepid sponging may be used with safety.

The great object being to keep the circulation as uniform and tranquil as possible, an equable temperature must be carefully maintained; for this purpose, the clothing should be uniformly warm over the body, and while heat is to be shunned as stimulating to the heart, sudden exposure to chills must be as carefully avoided; lest by driving the blood from the surface, it should call for too great an effort to return it, or failing this, endanger the life of the patient by syncope.

In the period of the disease of which we are now speaking, that, namely, in which there is opportunity for preventive management, there is no need for much therapeutic treatment; but the occasional employment of remedies tending to regulate the amount of the circulating fluid and allay palpitation, will promote the comfort and prolong the life of the patient. Repeated small bleedings have been proposed with this view, but their employment is most mischievous. Blood should not be drawn except to relieve some alarming congestion in the brain or lungs, and then its abstraction can only be regarded as an unavoidable evil. Where any tendency to congestion (manifesting itself in vertigo, congestion of the countenance, or even increased excitement of the heart) seems to indicate the expediency of some reduction in the volume of the blood, the best means of effecting it will be by moderate hydrogogues and diuretics. For this purpose two scruples of the pulv. jal. co. may be administered. The following formula will perhaps be a convenient one. (F. 46.)*

In promoting the action of the kidneys, and at the same time relieving the palpitation, a combination of senega with some diuretic will be eminently serviceable. The *modus operandi* of the senega under such circumstances is not quite obvious, but it certainly is specially useful in palpitation arising from aortic disease, though it has not the same good effect in disease of the mitral valve. The accompanying formula may be useful. (F. 47.)†

When there are any symptoms indicating the supervention of inflammatory action, such as increased sharpness of pulse with furred tongue, and other signs of pyrexia, without any other assignable cause for such excitement, we must, of course, apply the ordinary means of subduing such inflammation; but this must be done with every consideration for the strength of the patient. If necessary, a small quantity of blood may be taken, or, what is better, the patient may be cupped over the region of the heart to from four to six ounces, and if the skin is not hot a blister may be applied, and calomel, antimony, and opium, with salines, may be given. As regards the mercury, however, salivation is to be avoided, since it promotes spanæmia, which favours dilatation. In the greater number of cases, however, bleeding is not desirable, and mercury should be very sparingly used.

It is to be remembered that in treating of the early period of disease of the aortic orifice, we are speaking of the most hopeful form of heart-disease, and that in which most may be done by judicious management, but, in which, on the other hand, irremediable evil may be incurred by a single false step. A needless abstraction of blood, though it may even seem for the time to afford relief, or the wanton use of any lowering remedies, or even too much abstinence from nutritious diet, may lead to dilatation without hypertrophy, and its disastrous consequences; whereas over-stimulation or over-exertion may aggravate the primary mischief. For the latter reason iron will not generally be admissible as a tonic, but zinc in the form of sulphate, or where there is irritability of stomach, of oxide, will be useful (F. 48);* where there is much palpitation it may be combined with camphor (F. 49).†

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* (46) ℞ Pulv. Jalapæ co. ℈ iv.
Syrupi Zingiberis, ʒ ij. Misce.
Sumat dimid. mane.

† (47) ℞ Sp. Æth. nit. ʒ ij.
Tinct. Hyoscy. ʒ iss.
Decoct. Senegæ, ℥ iij.
Mist. Camphoræ, quant. suf.
Ft. Mist. ℥ iv. de que sumat part. 4tam ter die.

In the next period we have to do with increased dilatation and consequent delay in the passage of blood through the left heart, manifesting itself by symptoms of obstruction to the circulation through the lungs and liver, as dyspnœa, sometimes slight icteric tinge, scanty and turbid urine, &c.

There is now less to be done in the way of prevention, but rest must be most rigidly enforced. The bowels must be kept freely opened by moderately warm aperients and occasional doses of colocynth and calomel, or blue pill; or, where there is much œdema, the compound jalap powder may be employed. Diuretics will also be of service, and amongst these the combination of senega and nitric ether, recommended above. There is now more tendency to palpitation, and the camphor, henbane, and zinc may be used, though where the palpitation is very troublesome the zinc should be omitted. In the still more advanced cases, when palpitation and dyspnœa with orthopnœa become urgent, and signs of venous congestion begin to show themselves, the disease is evidently drawing to its termination, and the treatment must be mostly palliative, or similar to that employed in disease of the mitral valve.

The treatment of disease of the left auriculo-ventricular orifice is, for the reasons already adduced, less hopeful than that of the aortic, since we have to deal almost from the first with obstructed pulmonic circulation, and venous engorgement, with their consequent evils. The chief indications here will be to relieve the pulmonic circulation by expectorants, which must not, however, be of a very stimulating character, and the portal and general circulation, by purgatives and diuretics; though from the latter we often obtain but little effect, owing to the engorgement of the liver. When there is no albuminuria, the combination of squills and blue pill or grey oxide (F. 50),* may be continued till the gums are slightly affected, or till there is an obvious improvement in the secretion of urine. A diuretic mixture may be administered in the course of the day, and a moderate but effective purgative alternate mornings (for this purpose F. 13, p. 155, without the colchicum, will be applicable). The combination of senega with nitric æther, recommended above, may also be administered, but we cannot expect the same benefit from it as in disease of the aortic valves. The addition of tincture, or oxymel, or vinegar, of squills will render it more expectorant, and therefore more applicable to this form of disease, which, both in its symptoms, its consequences, and the treatment required, closely resembles pulmonic congestion caused by long-continued chronic bronchitis. Upon these grounds great temporary relief may often be obtained by large blisters applied upon the sternum or between the shoulders: and as our object should be to induce free serous discharge rather than irritation, the blister should be removed at the end of eight hours, and a large linseed poultice applied in its place.

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* (48) ℞ Zinci Sulphat. (vel Oxidi), gr. iij.
Ext. Lupuli, gr. vj. Misce.
Ut. Pil. vj. sumat i. ter die. Aug. Dosis zinci gradatim ad. gr. iij.

† (49) ℞ Zinci Sulphat. (vel Oxidi), gr. i.—iii.
Camphoræ, gr. i.
Ext. Hyos. gr. ii. Misce.
Ft. Pil. ter die sumend.

The remarks which have been made upon the treatment of the effects of disease of these two sets of valves apply, with but little alteration, to the direct and palliative treatment of hypertrophy and dilatation arising from other causes. Where the enlargement is merely of the left ventricle, the effects upon the circulation will be much the same as those arising from the second stage of disease of the aortic valves; and the treatment, as regards regulating the volume of the blood and the activity of the excretory organs, must also be the same; in like manner, where the enlargement is mainly on the right side, the treatment will be the same as that most applicable to disease of the mitral valve. As regards our efforts at producing some permanent relief we must be guided by what insight we can gain into the probable cause of the enlargement. When, for instance, hypertrophy of the left heart is the effect of thickening of the systemic arteries, we must regard the left ventricle as suffering over-distension, arising from an increase in the force which opposes its systole, and endeavour to regulate the circulation much as in early disease of the sigmoid valves.

Where, again, we have to do with cases in which there has been dilatation of the left ventricle, from over-exertion under unfavourable circumstances (as pointed out p. 343), tranquillity, moderately good living, and regular exercise will go far to obviate the mischief. Where the dilatation is the effect of weakness induced by carditis, gentle alterative remedies, as iodide of potassium, or, perhaps, iodide of zinc, which will combine the advantage of an alterative and tonic, should be used, and we must pursue, in other respects, the same plan as in the last case, but with greater restriction as to exercise and less hope of radical amendment.

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* (50) ℞ Pil. Hydrarg. gr. iij.
Pil. Scillæ co. gr. vij.
Ft. Pil. ij. h. s. sumend. Or,

℞ Hydrarg. Oxidi, gr. iss.
Pil. Scillæ. co. gr. x.
Ft. Pil. iij. h. s. sumend.

Since the publication of the former edition of this work, the author has seen no reason to alter his opinion as to the unity of the causes of true hypertrophy. He is, indeed, aware that another has been assigned for this lesion by a distinguished pathologist, whose investigations have thrown much light upon many questions relating to disease of the lungs and heart. Dr. Gairdner, of Edinburgh, has adduced many instances of hypertrophy of the heart in which it was associated with collapse of the lung, from which he argues that the enlargement is not the result of any obstruction to the circulation through the chest, but is the effect of diminished pressure upon the surface of the heart, arising from the diminished bulk of the lung, the result of which is that the heart enlarges to fill up the vacuum which would otherwise be produced in the chest.

It would be foreign to the purpose of this work to enter minutely into the arguments upon either side of the question; but it does appear that the theory, having been propounded by so respectable an authority, and adopted by others no less so, it would appear uncourteous not to notice it.

About twenty years ago, Dr. Chevers, then a young physician of extraordinary promise,—now secretary to the Director-General in Bengal, and one of the most distinguished of Indian practitioners,—published in the 'Guy's Hospital Reports' and the 'Medical Gazette' a series of cases in which he showed that hypertrophy was the effect of valvular obstruction; and although those cases failed to establish (what they were probably never intended to prove) that valvular obstruction is the alone cause of hypertrophy, they did prove that valvular obstruction induced hypertrophy; and he thereby established the connection between obstruction and hypertrophy, showing that the former was capable of producing the effect in question; and, more than that, that the hypertrophy was the greatest in the cavity immediately tergal to the obstruction. About the same time the author of the present work published in the same periodicals, some observations upon 'Defective Expansion of the Lungs,' in which he showed that in many cases in which the capacity of the entire thorax was defective—such defect being often associated with diminished calibre of the trachea—there was hypertrophy of the heart, with more or less of dilatation; and, what was remarkable, that the enlargement of the heart was most conspicuous in that cavity which was immediately tergal to the obstruction to the circulation. Thus, in the cases just specified it was in the right ventricle, which generally included the apex of the heart, owing to its great enlargement proportionately to the left; the next greatest enlargement being in the right auricle, whilst the left heart was generally but little enlarged, and in some cases absolutely the reverse. Instances were also adduced in which there was obstruction from disease of the mitral valve, and in which the left auricle was greatly enlarged, and next to it the cavities on the right side of the heart; whilst the left ventricle was proportionately, if not absolutely small. It is, then, evident from the cases just adduced, as well as from the well-known instances of disease of the aortic valves, that obstruction to the circulation is a cause capable of producing enlargement of the heart, commencing with the cavity immediately tergal to it. And we see from cases of chronic bronchitis, as well as protracted effusion into the one of the pleural cavities, that such a cause may exist in the pulmonic circulation, and arise, too, from pressure upon or apneumatosis of the lung. Obstructed pulmonic circulation is, therefore, a *vera causa* in the strictest use of the term. Not only too is obstructed circulation, but obstructed circulation such as we have just specified, capable of producing the effect assigned to it, namely, hypertrophy and enlargement of the walls and chambers of the heart. Whereas, on the other hand, when we consider how carefully the heart is protected in the mediastinum from the effects of atmospheric pressure, we cannot admit the diminution of such pressure as a *vera causa*. Neither can we regard it as one capable of producing the effect assigned to it, since we have yet to learn that growth and development are in an inverse ratio to the height of the barometric column.

Acute inflammation of the aorta, or acute aortitis, is a very rare disease, and one of which the signs are very obscure. Dr. Chevers, to whom we are indebted for most of our knowledge respecting it, states that it proves fatal by asthenia, complicated with comatose symptoms. The pulse is exceedingly rapid, often indistinct, though somewhat wiry; their pulmonic circulation being at the same time much obstructed stertorous breathing, venous congestion, and swollen extremities. For the anatomical changes produced by acute inflammation of the arteries, we would refer the reader to the work of Doctors Jones and Sieveking.

The diagnosis of acute aortitis is very obscure; the difficulty is no doubt, in great measure, owing to the rarity of the affection, particularly as a primary lesion; and where it has supervened upon other diseases, it has, as Dr. Walshe observes, produced no additional symptoms besides increased irritability or distress. Where, however, we have, in addition to the latter symptoms, pain, thrilling pulsation, and arterial murmur along the course of the aorta, we may suspect this disease, though we can hardly venture further than a surmise in our diagnosis.

Chronic inflammation of the aorta and large arteries is a much more common occurrence, and produces fibrinous deposit, atheroma, ossification, aneurism, and, sometimes, ulceration. For a description of these changes, we would again refer to the work of Doctors Jones and Sieveking. The importance of these affections in regard to the practice of medicine consists in their destroying the elasticity of the artery, rendering it in some parts unable to recover its proper size under distension, and in others preventing its yielding sufficiently to the injecting force of the heart. Hence there will arise an irregularity in the calibre of the artery. It becomes in some parts dilated, and in others narrowed. One result of this loss of their proper contractility on the part of the aorta and large arteries is, that the machinery whereby the uniform current of the blood is maintained, being impaired, the pulse becomes splashing, or of the water-hammer character, much resembling that produced by disease of the aortic valves (p. 68). The effect of this condition of the aorta upon the heart must likewise be nearly the same as that resulting from disease of the above-named valves, and there will in course of time ensue hypertrophy and dilatation, with their consequences, the tendency to fatal termination being the same.

The physical signs of this form of the disease of the thoracic aorta also closely resemble that of disease of the valves: there will be a systolic murmur traceable up the course of the ascending aorta, and the same will be to be heard along the spine; the pulsation of the aorta will also be frequently to be felt above the sternum; and as the disease generally more or less implicates the arteries, we shall have similar murmurs in the course of the innominata, the sub-clavian, or the carotids.

These murmurs must of course be carefully distinguished from anæmic ones; but besides this history of the case, and in most instances the absence of anæmia sufficient to produce the murmur, there will be the characteristic pulse, with the hard artery (p. 69). Disease of the arch of the aorta is often accompanied by great dyspnœa, liable to severe paroxysmal aggravations, arising probably from irritation of the recurrent nerve.

Where we have strong reason for believing in the existence of acute inflammation of the aorta, our treatment should be decidedly antiphlogistic; not indeed that general bleeding will be tolerated in the majority of instances, since the moving powers of the circulation are sometimes so much depressed as to threaten to destroy life by apnœa; cupping at the sternum or in the course of the spine will, however, generally be borne. Where the depression is very great, we must be content to employ dry cupping; and where there is no great heat of skin, a blister may be applied along the side of the spine; calomel in small quantities, opium, and antimony should also be employed, and saline diaphoretics administered in the intervals.

The effects of chronic aortitis, as also those of alteration in the calibre of the aorta, or of loss of its contractility, are, for reasons already explained, the same as those of obstruction to the circulation from coarctation or thickening of the aortic orifice, and must be treated accordingly.

Aneurism is a most important form of disease of the aorta. Into the varieties and anatomical conditions of aortic aneurism we do not now enter, our business being mainly with its symptoms and management. Chronic changes in the aorta of the character above alluded to are more frequent, in its ascending portion and the arch, than at a greater distance from the heart, and it is probably upon this account that aneurism also is more frequent in the same situation; not to mention that this part of the artery is, more than any other, exposed to the direct impetus of the blood thrown from the left ventricle.

Sometimes these aneurismal pouches form so near the origin that they have been known to burst into the pericardium, causing instant death to the patient; though the lesion has manifested itself by no appreciable symptoms during life.

When the aneurism forms higher up in the ascending aorta or in the arch, it generally increases so as to form a considerable tumour, and then its presence becomes apparent, by the symptoms of the pressure upon the neighbouring structures, by the effects upon the circulation generally, and by physical signs presented by the aneurism itself.

The effects upon the neighbouring parts may not manifest themselves for some time. When the tumour is in the ascending aorta these symptoms are for a long time very obscure; but if the patient's life be not early destroyed by the giving way of the sac, a pulsating tumour shows itself in the course of the vessel. Sometimes, again, the nature of the affection becomes apparent from a sudden gush of arterial blood from the mouth; or sometimes its presence may be suspected by more frequent but slighter attacks of hæmoptysis.

We noticed, when speaking of phthisis, that the arteries are the structures which, of all others, are the slowest to become involved in the destruction of the surrounding lung, and, it would appear, that even when they do get morbidly enlarged, the neighbouring tissues become absorbed rather than the artery itself under the pressure; so that the sternum, or cartilages of the ribs, or the trachea, or bronchi, disappear before it: or, if it be seated more posteriorly, the œsophagus or bodies of the vertebræ are similarly destroyed. When the aneurism is in the arch of the aorta, one of the earliest signs is not unfrequently a peculiar huskiness of voice, with difficult respiration, attended with some distress, the effect probably of pressure upon the recurrent nerve: vague lancinating pains in the chest and back, sometimes extending into the back of the head, are also amongst the earliest symptoms, produced probably by pressure upon the nervous trunks. Difficulty in swallowing, again, is often produced by pressure upon the œsophagus; and another remarkable effect of the pressure of aneurismal tumour is that upon the large veins, producing distension of the veins of the chest, neck, face, or even the upper extremities, sometimes giving rise to œdema of these parts. In other cases, again, there is atrophy, from the pressure reaching the thoracic duct.

The above effects might, in the greater number of instances, be produced by any other tumour in the same situation, though it is one in which none is so likely to occur as aneurism. But besides these there are the effects produced upon the circulation generally, and more especially upon the arterial system. The first and most obvious impression must be upon the left ventricle, the systole of which is more or less impeded by the obstruction in the aorta; for even if there have not been sufficient coagula to obstruct the channel, the very fact of disease in the artery destroys that elasticity by which it assists in forwarding the current of the circulation, and consequently induces more or less hypertrophy and dilatation. The current along the arteries must also be disturbed by obstruction so near its commencement; and consequently we have a degree of thrill or splashing not unlike that produced by disease of the aortic valves, though in a less degree. In short, the effect upon the circulation is in general not unlike that of the latter affection. Besides this, however, we may have great obstruction to the current either through the aorta, the innominata, the left subclavian, or common carotids. This may arise either internally from the clot, or from the aneurismal sac pressing upon the artery from without. When the aorta itself is thus obstructed the pulse at each wrist will be similarly affected, so that it may be very small, and in some rare instances it has been wholly obliterated. When, however, the pressure is upon the large arteries, there will be a difference according to the side affected, and consequently the pulse at one wrist may be almost imperceptible, whilst that of the other remains nearly natural.

The physical signs presented by the aneurismal tumour itself are generally, pulsation and sound. The pulsation is, in most cases, expansile, that is to say, extending itself laterally as well as anteriorly, and synchronous with the systole of the heart. There are, no doubt, exceptions to this rule, since the clot may be so large that the current which passes through the sac may not be sufficient to cause any perceptible expansion, and, in some cases, even any movement which can be detected by the hand. The sounds which may be heard by placing the stethoscope on the projecting part of the surface are in the majority of instances double, consisting of a first sound, which we call systolic, as accompanying the systole of the heart, though it in reality attends what might be termed the diastole of the aneurismal sac; and a second or diastolic sound, synchronous with the diastole of the heart, though with the systole of the aneurism. The first of the above murmurs is produced by the roughened condition of the artery, and the agitation of the current produced by the change in size which the current undergoes in passing from the artery into the sac. The diastolic, or second murmur, is to be referred to the exit of the blood produced by what may be termed the systole of the sac. The above are the sounds which are commonly heard, and which are obviously to be explained by this aneurismal condition; but it is evident that they must be liable to great modifications, and that many circumstances may interfere with their production. Thus the first, which is ordinarily the loudest, may be very feeble or altogether wanting, owing to the entrance to the orifice being very smooth; and if, on the other hand, the exit be disturbed, by moveable fibrine, the second or diastolic murmur will be rendered the loudest. If the action of the heart be very feeble, the orifices of the aneurism very free, the channel through the aneurism very smooth, or the pouch rendered incapable of distension by the deposition of fibrine, one or both murmurs may be absent.

From what has been said, it must be inferred that the diagnosis of aneurism is often exceedingly obscure, as many of the signs often regarded as diagnostic may be absent, and, on the other hand, several may be simulated by other tumours. The early diagnosis of this affection has been admirably given by Dr. Addison:—" When the aneurismal swelling is such as to cause injurious pressure upon neighbouring parts, and interrupt the functions of particular organs, our apprehensions are likely to be awakened; and if we find the heart's action greatly disturbed, without our being able to trace it to any decided disease of the organ itself, or to sympathy with disease in other parts—if we observe the flow of blood passing to the descending cava to be much obstructed—if we have indications of pressure upon the trachea and bronchi or upon the pneumogastric or recurrent nerve, producing hoarseness and feebleness of the voice, croupy cough and respiration, or symptoms of spasmodic asthma, o of spasm of the glottis—if there be anomalous symptoms of bronchitis, pneumonia, or hæmoptysis—if deglutition be painful or so difficult that the patient is under the necessity of making a double effort before the meal will descend into the stomach—and if he complain of vague or severe rheumatic, lancinating, or grinding pains about the back of the neck, in the upper extremities, or shooting from the sternum to the sides, and towards the back, the existence of an aneurism becomes more than probable."

In the management of aneurism our chief object should be to maintain the current of the circulation at the lowest possible volume; but at the same time the power of the circulation must not be much depressed: for if the latter effect be produced, there will, in the case of aneurismal dilatation, be a danger of promoting dilatation of the left ventricle, and it may be also of rendering the pouched artery more yielding; and, in the case of a sacculated aneurism, of rendering the coagulum so loose as to be ineffective as a support to the weakened parietes of the sac. When there is much tenderness over the tumour, a few leeches may be from time to time applied. Great relief, and an apparent reduction of the tumour, has been obtained by the continued application of a bladder of ice. Repeated very small venesections are not, as Dr. Chevers observes, so objectionable in the case of aortic aneurism as in that of ordinary heart disease; but when these are employed mild tonics should be at the same time exhibited. The important object, however, of obtaining the conditions most favourable for the relief of the disease, namely, a moderate volume of circulating fluid with a good proportion of fibrine, will be best obtained by a scanty use of fluids, a nutritious diet, the employment of purgatives, and occasionally diuretics (the former being to be preferred as less likely to promote a spanæmic condition), and by the use of gentle tonics. Of the latter class of medicines zinc is one of the most eligible, from its not producing any stimulating effect upon the heart, which is sometimes the case with iron. The senega also, which we have already recommended in disease of the aortic orifice, will often be of great service; allaying excitement without depressing the vital powers: it may be combined with a diuretic, thus (F. 47, p. 397). A pure air is of the greatest importance, since, under the necessity for rest, it presents the means of maintaining the plastic power of the blood.

Angina Pectoris.—There is another disease of the chest the symptoms of which are familiar to most practitioners of experience, but of which the pathology has never yet been fully explained, and of which it is difficult to say whether it has its origin in lesion of the heart, or the large arteries, or the nervous system. "The seat of it, and sense of strangling and anxiety with which it is attended" (says Dr. Heberden, who was the first to describe it), "may make it not improperly be called angina pectoris."

"They who are afflicted with it are seized while they are walking (more especially if it be up hill, and soon after eating) with a painful and most disagreeable sensation in the breast, which seems as if it would extinguish life if it were to increase or continue; but the moment they stand still all this uneasiness vanishes. In all other respects the patients are, at the beginning of the disorder, perfectly well, and, in particular, have no shortness of breath, from which it is totally different. The pain is sometimes situated in the upper part, sometimes in the middle, sometimes in the bottom of the os sterni, and often more inclined to the left than to the right side. It likewise very frequently extends from the breast to the middle of the left arm. The pulse is at least sometimes not disturbed by this pain, as I have had opportunities of observing by feeling the pulse during the paroxysm. Males are most liable to this disease, especially such as have passed their fiftieth year. After it has continued a year or more, it will not cease so instantaneously upon standing still, and will come on not only when the persons are walking, but when they are lying down, especially if they lie on the left side; and oblige them to rise up out of their beds. . . . The termination of the angina pectoris," continues Heberden, "is remarkable, for if no accident intervene, but the disease go on to its height, the patients all suddenly fall down, and perish almost immediately; of which, indeed, their frequent fainting and sensations, as if all the powers of life were failing, afford no obscure intimation.

"On opening the body of one who died suddenly of this disease, a very skilful anatomist could discover no fault in the heart, in the valves, in the arteries or neighbouring veins, excepting some small rudiments of ossification of the aorta. The brain was likewise everywhere sound."*

Here, however, it is to be remarked that in the one instance in which Heberden has put upon record the appearances after death, there was no marked change, *excepting* some small indications of ossifications in the aorta; but this exception is a most important one; ossific deposit, to however small an extent, must have been the product of disease of some standing, and it is hardly a bold assumption to predicate that with it there was probably considerable fatty degeneration of the heart; but be that as it may, symptoms resembling those of angina pectoris have often been met with in connection with disease of the arch of the aorta, though it may be uncertain whether such disease was the cause of the symptoms, or whether, if it were, it was so by impeding the action of the heart mechanically, or by pressure upon the recurrent nerve. Dr. Latham, again, who has graphically described this disease,* and has spoken of angina pectoris as a disease of which our knowledge stops short with its symptoms, nevertheless states that it is often met with in connection with several forms of organic disease of the heart, which are thus marked out by Dr. Stokes:†—

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* Heberden, 'Commentaries,' pp. 364—368.

1. Weakness and attenuation.

2. Weakness, with fatty degeneration.

3. Some form of valvular disease, generally affecting the left side.

4. Disease of the aorta, with or without obstruction of the coronary arteries.

We may here remark that all those conditions were within the category of insufficient power of the cavities of the heart to maintain the circulation, whether from inherent weakness or mechanical obstruction; some of them being such as would immediately produce such obstruction; and the treatment which is found most applicable to this disease is that most in accordance with this view. During the paroxysms, æther, in the form either of the Hofmann's anodyne, or the chloric æther but the former is most to be relied on), with ammonia and a little laudanum, will often give great relief; and we have reason to believe that the progress of the disease may be checked, or at least retarded by a regimen and treatment such as we have recommended for dilatation of the left ventricle from aortic disease—gentle exercise, good nourishment, and good air—these being the most likely means of checking the degeneration and dilatation so often associated with angina. We believe, too, that here, as in the former disease, the senega will be found a tonic to the heart.

We cannot quit the subject of disease of the vascular apparatus without some mention of *phlebitis*, or inflammation of the veins.

It having been generally assumed that the deposits of pus found in the liver, the lungs, and elsewhere, were the product of inflammation of the lining membrane of a vein, the word phlebitis was accordingly employed to express the disease to which the term pyæmia or ichoræmia is now generally applied; the truth being that it is by no means certain that the lining membrane of the veins does actually inflame; and it is certain, as has been already observed, that the infection of the blood often observed in connection with suppuration cannot be explained upon the hypothesis of inflammation of a vein. It is true, indeed, that a vein may be often found obstructed by a fibrinous mass; but it is by no means evident that this is the result of inflammation of the lining membrane of the vessel, it being next to impossible to distinguish between a fibrinous layer formed out of the blood by arrested circulation, and inflammatory lymph. A vein may, indeed, become inflamed, and in such a case its coats are softened and infiltrated by lymph or puriform matter. The most marked cases of phlebitis are, as Dr. Wilkes observes, chronic, in which the veins are obstructed by fibrin, firmly united to the coats of the vessel, so that it becomes in time perfectly obliterated: this has been observed to happen in the inferior cava; in which case the superficial veins of the abdomen, and, sometimes, the azygos vein, are found to be enormously distended.

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* See 'Lectures upon subjects connected with Clinical Medicine,' pp. 864, et seq.

† 'Diseases of the Heart,' p. 481.

The word phlebitis has, as we have just observed, been often used to express that form of blood disease to which, as we believe, the term pyæmia or ichoræmia more properly belongs. Of this disease the symptoms have been already pointed out (p. 60). Of its treatment, so far as any treatment is available, we have little to say. It is essentially a disease of debility. Bark and ammonia, with chlorate of potass, should be administered from the first, and wine and stimulants in moderate quantities at the commencement, and afterwards increased according to the failure of the powers of the system.

The treatment of true phlebitis falls, perhaps, more properly within the province of the surgeon. We may, however, here remark that our object should be to relieve the local hyperæmia, allay constitutional irritation, and support the strength of the patient. With these objects, when the vein is within reach, apply leeches and warm fomentations (though the former should only be used at the commencement of the attack), around the course of the vessel; keep the limb supported slightly beyond the horizontal position, that is to say, in the case of the thigh; let the foot be raised rather higher than the hip, as the patient lies on his back: let the bowels be kept gently open; the liq. am. citrat. or liq. am. acetat., with excess of ammonia, and a little tincture of hysoscyamus administered three or four daily; and when there is much restlessness, and it is not contraindicated by other symptoms, an opiate at night.

The distension of the veins on the surface of the abdomen, above alluded to, may also arise from a tumour pressing upon the ascending cava, such as an aneurism, a mass of hydatids, or any malignant or other growth, or it may be produced by a new growth within the vessel. Of this a case is recorded in the 'Guy's Hospital Reports,' Second Series, vol. ii., p. 398, in which the growth seemed to commence in the right kidney or emulgent vein, and extended up the cava to the right auricle. A similar obstruction may arise upon or within the descending cava or internal jugulars from similar causes, giving rise often to œdema of the face or upper extremities: this is sometimes produced by tumours or new growths in the bronchial glands or anterior mediastinum.

XVII.

DISEASES OF THE PHARYNX, ŒSOPHAGUS, AND STOMACH.

ACUTE inflammation of the œsophagus rarely occurs except as the effect of chemical or mechanical irritation. The symptoms are, pain, with inability to swallow either solids or liquids, but especially the former; the attempt being attended with great suffering, and the matters immediately rejected. The most appropriate treatment for this inflammation is local depletion as near the situation of the affected part as it can be applied, and what is of more importance, rest of the inflamed structure: this is obtained by almost total abstinence, nothing being taken except a very little thin barley-water, or milk and lime water. These last may be used in equal parts, of which mixture a tablespoonful may be administered about every two hours; the abstinence itself will be a means of subduing the inflammatory action, and where the irritation is very severe, the rest allows it opportunity to subside. When, however, the irritation and consequent inability to swallow continues so long as to endanger the life of the patient by inanition, enemata of beef tea must be administered.

After inflammation of the œsophagus, the part involved is liable, as in the case of the urethra, to contract, and thus obstruct the passage through the canal: under these circumstances surgical aid may be employed to pass bougies down the tube, by which, however, only temporary benefit is often obtained, and the patient ultimately dies of inanition. Here also life may be prolonged by the diligent use of nutritive enemata.

When there is stricture of the œsophagus, the portion of the tube above it is apt to become dilated, from distension by its accumulated contents. But the same dilatation sometimes takes place without such stricture (possibly as an effect of inflammation, as we shall observe in other parts of the canal), and, what is somewhat remarkable, we have an effect similar to that which is produced by stricture, namely, difficulty in swallowing.

Ulceration is sometimes the effect of the obstruction; in which case the contents of the œsophagus may be extravasated into neighbouring parts. This ulceration may, though rarely, take place spontaneously. In a case which occurred to the author, a gentleman of not very temperate habits, after taking a considerable quantity of wine, was sick, and soon after vomiting, or in the act, was seized with severe pain in the side, with symptoms of sudden effusion, either into the chest, or upper part of the abdomen. He sank rapidly, and died in about eighteen hours. Upon examination after death, a considerable quantity of port wine was found in the right pleural cavity. In the pleura was a small rent near the vertebræ; and, corresponding to it was a perforation in the œsophagus, produced apparently by a circular ulcer, without any elevation of the edges, and resembling those which occasionally occur in the stomach, and which will be noticed hereafter.

Obstruction of the œsophagus may also be produced by malignant disease in any part of its course: this most often occurs about its termination in the cardiac orifice of the stomach, in which case the pain, and rejection of the food, are as violent and as immediate after the attempt to swallow as when the stricture is high up in the tube. The same symptoms may also arise from the pressure of aneurismal, or other, tumours of neighbouring parts.

The œsophagus, like every canal surrounded by muscular tissue, is liable to have the passage of its contents obstructed by irregular contraction of these fibres, causing the food as soon as it has passed into the gullet to stop, occasioning a sense of pain either between the shoulders or in the passage itself. The symptoms are, as Dr. Watson observes, "the same as those which result from permanent stricture of the gullet, except that they are not permanent. When the stricture is organic and abiding, the symptoms occur during or after every meal. When it is simply spasmodic, they come and go capriciously."* Spasmodic stricture may be independent of any disease of structure in any part of the body, but it is of some importance to be aware that it may also be symptomatic of very serious organic changes, as, for instance, ulceration in the larynx or even at the cardiac orifice of the stomach. True spasmodic stricture most commonly occurs in persons of a highly-irritable state of the system, as, for instance, in hysterical females, or persons reduced by hæmorrhages or excessive discharges of any kind, and is best relieved by checking or removing the weakening cause, and administering iron or zinc. In hysterical subjects the same remedies are applicable, the iron being preferred when there is evidence of anæmia, the zinc in the more purely hysterical subjects, in whom anæmia is not necessarily present: the tincture of valerian may also be advantageously given at the same time with the mineral tonics.

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* Dr. Watson's Lectures on the Practice of Physic.

Before proceeding further in the consideration of diseases of the alimentary canal, we may briefly notice one or two affections which were omitted in speaking of the larynx, since it would be difficult to say whether they belong more to diseases of that organ or of the commencement of the alimentary canal.

And first amongst these is the ulcerative inflammation of the mouth, the *stomatitis ulcerativa*, characterized by ulceration in the mouth generally, but more especially in the gums. It is commonly attended with considerable constitutional disturbance, and at the same time there is generally a copious salivation, with great fœtor of the breath. This affection generally requires, the use of a local application of a lotion of alum and zinc, and the internal exhibition of the chlorate of potass, in doses of from ten to twenty grains three or four times a day.

A formidable disease is the *cancrum oris*, or gangrenous inflammation of the mouth, frequently observed in children of feeble constitutional powers, and more especially in those that have been ill nourished, or brought up in badly-drained localities and ill-ventilated houses. It is believed by some to be the result of mercurial salivation: it is, however, often met with where that drug has never been administered. It may arise spontaneously, but it most frequently occurs after some exanthem, as measles or scarlatina. It first shows itself in the form of a hard, white swelling on the cheek, whilst in the corresponding part of the inner surface may be seen whitish ulcers or eschars. This swelling rapidly turns black, and the whole side of the cheek becomes gangrenous. Sometimes it may be first observed as an ulceration of the gums, which extends to the cheek, destroying in a short time the whole side of the face, exposing the tongue and pharnyx, and causing the teeth to fall out.

Recovery from this disease is very rare, and is at the expense of exfoliation of portions of the jaw, and extensive destruction of the soft parts.

As this is essentially a disease of low constitutional power, and inability to maintain the process of reparation, our only chance of success lies in the free use of tonics, stimulants, and nourishment. At the commencement, a stimulating liniment, as the linim. camphoræ compositum, should be applied to the cheek; but should signs of gangrene have appeared, a poultice composed of linseed-meal and warm nitric acid lotion may be employed, and the same lotion used for the inside of the cheek.

Every care should be taken to secure the purest atmosphere that circumstances admit of, and the most scrupulous cleanliness should be observed. Quina, or bark, with ammonia, should be administered at the same time; the most appropriate combination will generally be chlorate of potass with ammonia and compound tincture of bark in the decoction (see p. 368), the doses of the latter being regulated according to the age of the patient.

Like all other organs of the body, the stomach is liable to congestion, active or passive; and this perhaps in a greater degree than most, owing both to the highly vascular structure of its lining membrane, and its close proximity to the centre of the circulation. It is most important to be acquainted with this tendency to congestion, since it may often be a matter of great importance, though of no less difficulty, to distinguish it from acute inflammations; the difficulty being enhanced by the tendency of the congestion to pass into inflammation, and also by the varied appearances of its inner surface, depending upon the presence or absence of food in the stomach. There can be no doubt, too, that active hyperæmia may be excited by stimulating articles of diet, and also by excessive quantities, this hyperæmia either subsiding under abstinence, or passing to inflammation, to be presently described.

Congestion of the stomach of a passive or mechanical character is also one of the most frequent results of protracted diseases in the chest, which impede the pulmonic circulation, and obstruct the return of the blood to the heart; the impediment thus produced being propagated through the portal system to the spleen and stomach and other viscera. After death, the mucous membrane is found in a state of intense hyperæmia, or capillary congestion, and covered with a tenacious mucous secretion. There is also sometimes effusion into the submucous tissue. This condition is one which it is impossible by its appearance to distinguish from any degree of inflammation short of ulceration, and in the secondary form it partakes, probably, more or less of an inflammatory character; since, where it has been so found, it has been associated during life with, pain in the epigastrium extending through between the scapulæ, sickness, and loss of appetite. It is often a source of great additional distress in such disease, and frustrates all attempts to give that amount of support which may be thought desirable. It should be remembered, too, that unless this condition can be in some degree controlled, the pressing food upon the patient is often but a futile addition to his suffering. This remark applies particularly to some forms and stages of phthisis, in which disease there is a great difference as to the power of taking and retaining nourishment in different subjects, though in most it is desirable to give it as freely as it can be taken. The explanation of the difference lies in this, that in many cases of phthisis where there has been a rapid deposition of tubercle in the lung, respiration and the pulmonic circulation have become obstructed, before there has been such an amount of ulceration and suppuration as materially to diminish the volume of the circulating fluid; the consequence of which is that congestion of the liver and stomach ensues, as in cardiac disease; and hence there are epigastric pains and loss of appetite: whereas in those cases in which there has been great destruction of the lung by ulceration and suppuration, the latter process has so drained the system that the diminished lung is adequate to the diminished volume of the circulation, and therefore the congestion just spoken of does not occur; and if the digestive organs be sound, there may be even an increased appetite.

These cases of secondary congestion of the mucous membrane of the stomach are, in a practical point of view, interesting chiefly as explaining the epigastric pains, and the loss of appetite associated with the diseases just alluded to. Their treatment must be regulated, in great measure, by that of the primary affection; but as they are in general the result of obstructed portal circulation, and will continue as long as that obstruction is maintained, our chief reliance must be upon the moderate use of saline and other aperients, by which the surcharged portal vessels may be in some measure relieved. Diuretics, especially the acetate or bicarbonate of potass, will help to promote the same end. When this object has been in some degree attained, those articles of the materia medica which have an astringent effect upon the mucous membrane of the stomach may be had recourse to, such as bismuth, oxide of silver, and nux vomica.

Acute gastritis, by which is meant inflammation of the mucous membrane of the stomach, is a rare disease in adults, except as a consequence of some irritant or acrid poison; though it is not uncommonly met with in young children. The anatomical changes produced by it are a vivid redness of the mucous membrane, from injection of the minute bloodvessels, ecchymosis into the sub-mucous areolar tissue, with softening of the membrane, so that it may be readily peeled off: the mucous follicles are rendered prominent, and here and there there are minute ulcers: sometimes portions of the organ are found thickened, probably from tumescence of the areolar tissue, at other times the parietes are much attenuated, though this is probably a post-mortem effect of the gastric juice. It should be remembered, however, that the degree of injection of the minute vessels of the mucous membrane of the stomach is a very fallacious sign of inflammation having existed before death; since not only will these vessels become injected from mechanical causes at or soon after it, but also their mucous surface, in which there has been unquestionably much irritation during life, may become pale after death.

The characteristic symptoms of this disease are great irritability of the stomach, with pain, and extreme tenderness in the region of that organ; the pain as well as sickness being excited by anything except the blandest liquids, and sometimes even by these. This pain extends round the hypochondria, and is particularly complained of between the shoulder-blades; there is urgent thirst, the tongue is white and furred, or brownish, and rather dry towards the centre; it is almost always red at the tip and edges. The pulse is small, soft, and frequent, and there is excessive prostration. The skin is generally hot, the bowels confined, and the urine scanty and high coloured. As we have observed, however, it is in children that we are most frequently to expect this disease, and here we often find some spasmodic affection associated with it; generally a chronic spasm of the flexors of the fore-arm wrist and fingers, on one or both sides, often a similar affection of the lower extremity. The subsequent progress of acute gastritis, if not relieved, coincides with what might be anticipated from the combined effect of irritation near the solar plexus, and continued inanition; the pulse becomes more and more feeble, the eyes sunk and hollow, there is wandering delirium, or stupor, pallor of the countenance, with cold, shrunken extremities, and the patient dies of gradual syncope.

The causes of the disease are very obscure: as before stated, it is rare in adults, unless induced by irritant poisoning, though it may be excited by the irritation of indigestible food in a system rendered susceptible of such irritation by protracted mental anxiety. In children gastritis may be set up by the irritation produced by teething, and probably also by improper articles of diet, allowed through carelessness or ignorance, and possibly by substances actually poisonous, taken in the same way, and by swallowing hot liquids. It may also arise from the retrocession of gout, erysipelas, or rheumatism, but more especially the former. Gastritis may also occur in connection with the exanthemata, and continued fever; though these cases are more rare and less violent than they are commonly described. The ordinary causes of inflammation, such as exposure to cold or damp, may excite inflammation of this as of other mucous surfaces. Violent sickness may arise from inflammation or irritation of the kidneys, though in the latter case the injection of the mucous membrane of the stomach, which may be found after death, occurs rather as the effect than the cause of the vomiting; and the same remarks apply to sickness from intestinal obstruction.

The diagnosis of acute gastritis is of considerable importance, from the fact of its being most commonly induced by irritant poisoning; and therefore, where the symptoms just pointed out are present, a most careful investigation must be instituted, as well by chemical examination of the contents of the stomach, as by the search for other kinds of evidence bearing upon this point. For information upon this head we would refer the reader to the works of Dr. A. Taylor, and other medical jurists. Care must also be taken to ascertain that there is no hernia or other intestinal obstruction, and, which is perhaps more difficult, that the disease is not inflammation of the peritoneal coat of the stomach: from this it may be distinguished by the redder tongue, by the tenderness being less intense and less diffused, and by the pulse being softer. From nephritis, or the irritation of a calculus in the kidney, gastritis may generally be distinguished by the absence of the pain described as belonging to the former, as well as by the burning heat in the epigastrium, and between the shoulders: examination of the urine will also assist the diagnosis, though it must be remembered that that secretion may be extremely scanty in both cases. The seat and character of the pain, even where there is no jaundice, will prevent the passage of gall-stones from being mistaken for gastritis, not to mention the greater frequency of the former affection.

The prognosis of gastritis is always doubtful. When it arises from irritant poisoning, the degree of danger must depend much upon the nature and amount of the poison swallowed; and even when it has arisen without such a cause, there is much danger from the depression produced directly by inflammation in this region, as well as by protracted inability to retain any nourishment. Continued sickness, failing pulse, cold extremities, and collapsed features are unfavourable symptoms. On the other hand, ability even to take the least nourishment, warmth in the extremities, and continued steadiness of the pulse may be regarded as favourable. The more frequent disease of infantile gastritis is also dangerous, though in such subjects the prognosis is perhaps more hopeful than in adults.

The treatment of gastritis is to be conducted mainly upon the principle of obviating the least excitement of the inflamed organ. Scarcely any medicines can be tolerated; and the practice too frequently adopted of administering repeated doses of calomel, is more likely to aggravate than relieve the symptoms. When the tenderness is great, and the prostration not excessive, a few leeches may be applied to the region of the stomach; and sinapisms in the same situation are at all times admissible, and generally beneficial. Equal parts of milk and lime-water, to the amount of about a tablespoonful of the two combined, may be administered about every hour, though, should even this excite sickness, it must not be persisted in; in which case the lime-water alone may be tried. Impatience as regards the action of the bowels is to be deprecated, though, should they not act for several days, a simple injection of gruel and salt may be administered; the patient may also be supported by injections of beef tea, administered twice or thrice in twenty-four hours. A similar plan of treatment may be pursued with children, and, if it can be retained, a little hydrocyanic acid may be given, with two or three grains of bicarbonate of soda with mucilage.

Though acute inflammation of the stomach is very rare, we cannot but expect that the lining membrane of that organ, which is exposed to so many sources of irritation, both mechanical and chemical, should become the subject of chronic, or of subacute inflammation. This inflammation, when long continued, produces thickening of the coats of the organ, and sometimes ulceration. In many cases the mucous membrane is roughened, thickened, and slate coloured; this latter appearance proceeding probably from the action of the gastric juice upon the blood detained in the smaller vessels. Sometimes, with apparently increased vascularity, the surface of the membrane is thickened, and covered with a tenacious mucus; at others, especially in hysterical females, in whom the symptoms often assume a character seemingly more acute, this mucus is bloody: these appearances are most remarkable about the large curvature. When ulceration occurs, the ulcers may be of every variety of size: in some instances they are less in circumference than a pea, with smooth and but slightly elevated edges; sometimes, though this is not so common, there may be one large ulcer, with irregular, or thickened edges. These ulcers are often about the small curvature, sometimes perforating the whole of the coats, and producing fatal peritonitis; at others, extravasation may be seen to have been prevented by adhesion to neighbouring viscera: sometimes the extravasated contents of the stomach have been found enclosed in a sac composed of the walls of adjacent viscera and false membrane, so that life has continued a considerable time after the escape of the contents of the stomach.

Caution is requisite in deciding upon the appearances of the inner surface of the stomach after death, as it is particularly liable to undergo changes in vascularity, from position, and, what is more deceptive still, changes in consistency, from the action of the gastric juice: these latter may even go to the extent of inducing solutions of continuity, that may by careless observers be mistaken for ulceration; and as these solutions of continuity occur most readily in those who die rapidly, and after little previous disease, they have given rise to the question of irritant poisoning. A specimen was once brought to the author for his opinion as to whether the death of a child had been caused by poison; the reasons for the suspicion being, that the child had been attacked with sickness, tenesmus, without any evacuation from the bowels, except a little blood, collapse, and death in a few hours; and that after death a large ragged perforation, surrounded by softening, was found in the large curvature; and further, that a portion of the intestines was in a state of intense inflammation. Upon being asked his opinion, he immediately inquired if the part so said to be affected was not near the ileo colic valve, and upon further examination it turned out that there was an intussusception in this situation, and that the affection of the stomach was a post-mortem solution by the gastric fluid.

The symptoms of ordinary chronic gastritis, are, pain in the epigastrium and between the shoulder-blades, increased by pressure at the scrobiculus cordis, and by taking food into the stomach: this latter feeling continuing for some time afterwards, or else not commencing till some time has elapsed, being referrible, in fact, to the process of digestion then going on. There is also in most cases nausea, vomiting of mucus or of the ingesta, languor, and restlessness, the bowels are irregular, the evacuations sometimes pale and at others dark; the tongue is generally coated with a drab-coloured fur, and red at the tip and edges: or it may be red throughout, or glazed and chapped; the pulse often quickened and sharp, the urine, frequently scanty and high coloured.

There is, however, a great want of uniformity in the symptoms. The pain is in some cases wanting, there being only a feeling of acidity in the region of the stomach: the vomiting, too, is often absent, especially at the outset; indeed this symptom depends much upon the seat of the irritation, being more urgent the nearer the latter is to the pylorus: and it would seem that the severity of the symptoms depends rather upon the extent than the depth of the irritation, since many cases have gone on to a fatal termination by a perforating ulcer, with scarcely any signs during life: the most common in such cases being a sense of heat and burning at the epigastrium, and between the shoulders.

Chronic gastritis may terminate by resolution, and the patient may very gradually recover his appetite, powers of digestion, and general health; in less favourable cases the disease may pass on to the still more chronic form of dyspepsia. In still more unfavourable cases, even of ulceration, there is reason for believing that the ulcers occasionally heal, but at other times they perforate the whole of the coats of the organs, causing death from peritonitis. Sometimes, before the perforation takes place, adhesion is established to a neighbouring viscus: but the ulceration rarely stops there; if the viscus be a hollow one, the ulceration goes on till it penetrates its walls; and thus an opening may be made, for instance, from the stomach into the colon. The adhesion may, however, be to a solid viscus, as, for instance, the liver, spleen, or pancreas; in which case there is great danger, that the ulceration proceeding, some considerable vessel, or a large number of smaller ones, being laid open, fatal hæmorrhage will ensue; or the same thing may happen from the ulceration opening an artery in the stomach itself. When the contents of the stomach escape into the general peritoneal cavity, death usually takes place at the end of between twenty-four and forty-eight hours.

Dr. Budd remarks that "in simple ulcer of the stomach pain at the epigastrium is sometimes felt when the stomach is empty of food, and, together with thirst and an impaired appetite, there are frequently sour eructations and occasional vomiting of a sour fluid. These symptoms seem to depend mainly on the presence of gastric juice or its acid in the otherwise healthy stomach." According to Dr. Habershon the symptoms of superficial ulceration of the stomach are—vomiting, pain at the scrobiculus cordis, pyrosis or water-brash, loss of strength or great prostration.

The causes of chronic gastritis are, a preceding attack of acute gastritis from any chemical or mechanical irritant, the habitual or frequent use of stimulating articles of diet or medicines, excessive indulgence in the pleasures of the table. Blows upon the region of the stomach may produce it, as will also the habit of leaning forwards so as to press the epigastrium against any solid body, as is observed in clerks at the desk, and still more in curriers and leather-dressers. It may also be induced by whatever excites a congestion of the lining membrane of the stomach or determines a flow of blood there; sometimes, as we have stated, it is a troublesome complication of those forms of disease of the heart or lungs which impede the circulation through the right side of the former. Chronic gastritis may occur in young females: frequently as a sequel of the hæmatemesis, which often attends uterine derangement, more particularly amenorrhœa, and this is, perhaps, of all others the form of chronic gastritis which is most apt to lead to ulceration: and it is a fact to be borne in mind that young females are, more than others, liable to perforating ulcers of the stomach, often without any previous sign of inflammation beyond a sense of heat or acidity in this region so slight as to have attracted but little attention. These ulcers are, however, not confined to such subjects, as they have been several times met with in elderly men, with the same absence of previously well-marked symptoms.

The treatment of chronic gastritis depends mainly upon the principle of removing as much as possible every source of irritation from the inflamed surface; the most obvious and most effectual mode of fulfilling this indication is the keeping the patient, strictly, to the blandest and most easily assimilated diet. For this purpose milk, as an article of food, is most eligible for those persons whose stomachs are not readily offended by it, and there are few with whom it will not be found to agree when combined with lime-water, and when but little or no other food is taken except bread. The Indian meal (or patent corn flour of the millers) boiled with milk is a nutritious article of diet, and at the same time soothing to the stomach.

When there is tenderness we must have recourse to more active measures, in the way of local depletion and counter-irritation. With this view six or eight leeches may be applied in severe cases to the scrotum cordis, and in a short time afterwards a blister. In those cases in which there is much congestion about the liver and spleen, and in which the stools are very dark, small doses of blue pill are very useful. This is best given in the accompanying form (F. 51),* and unless the bowels act freely, a draught of sulphate of magnesia with the carbonate should be given every morning. When the pain and tenderness have been subdued, and the tongue has become cleaner and the pulse more tranquil, recourse may be had to gentle tonics; amongst these is the infusion of calumba, to which may be added fifteen grains of bicarbonate of soda, and when the bowels are torpid, about half an ounce of infusion of rhubarb. Care will for a long time be required to avoid every source of irritation in the way of diet. When the patient has been used to stimulants, a little bitter ale may be allowed or light wine; about a dessert-spoonful of brandy in three parts of a tumbler of water is often recommended; but care should be taken that the proportion of the former is not gradually increased. We should not neglect to remind our patients that attention to the state of the skin in the way of frequent ablutions and moderate friction, is as essential to a healthy condition of the gastric as of the other mucous membranes. When there is reason to apprehend ulceration the restriction as to diet must be still more rigid, and if there be inability to retain nourishment its administration should not be persisted in, and recourse should be had to nutrient enemata. In one instance which fell under the observation of the author, a lady was unable, probably from this cause, to retain the least amount of nourishment in the stomach. Mr. Hetley of Norwood, her medical attendant, therefore, wisely desisted from giving any by the mouth, and sedulously administered beef-tea enemata; in this manner life was sustained without her taking anything by the mouth, beyond about a quarter of a pint of water in the twenty-four hours (with the exception of one or two abortive attempts at taking food) for fifty days, at the end of which time the irritability of the stomach began gradually to subside, and a little nourishment was taken, though no fæcal evacuation was passed for seventy-two days. It is worthy of note, too, that during this time only about a third part of the enemata returned as discoloured water: but that after the stomach and intestines regained their proper functions the whole amount was returned but little altered, thus showing that the colon is capable of assuming the functions of the stomach, to a limited extent, during disease of that organ, and of the upper part of the small intestines, though it does not readily perform the same office under ordinary circumstances.

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* (51) ℞ Pil. Hydr. gr. iss.—iij.
Ext. Conii, gr. xij.
Fiant. Pil. iij., sumat j. ter die.

In addition to the changes produced directly by inflammatory action, the stomach is one of the organs most prone to, cancerous disease, and new growth, in their various forms. The anatomical distinctions of these belong more to the province of the morbid anatomist, since, as far as our present experience teaches, the difference in the species of malignant disease affects but little the difference in the symptoms; though there may be a very great difference according to the part of the organ affected. The most sensitive portions of the stomach are, as we might almost have anticipated, its two extremities or orifices. These ostia for ingress and egress, are both guarded by sphincters, for the purpose not only of preventing regurgitation, but also of opposing the passage of matters which are unfit to be transmitted through them. They become, when organically diseased, sometimes mechanically closed, sometimes exceedingly irritable, sometimes permanently open; and, when there is excessive irritability or sensitiveness, the parts of the canal leading to them are easily excited, or become very susceptible of excitement to contraction, to prevent the approach of offending substances. Thus, when the cardiac of the stomach is the seat of cancerous disease, we have, in the earlier stages, great pain in the act of swallowing at first referred commonly to the region of the heart, or to the left hypochondrium, and (which is the case with nearly all painful sensation connected with diseases of the stomach) to the space between the scapulæ. In more advanced stages of the disease, and when there is considerable ulceration or excoriation, there is almost an inability to swallow, so much so that the patient often refers the seat of this obstruction to the throat. When the pylorus is the seat of the disease, there is little or no uneasiness in the act of swallowing; but after some time, usually about half an hour, there is considerable pain, generally described as a feeling of great distension, followed by vomiting: when, on the other hand, the large curvature is the seat of carcinoma, we have, for a long time, scarce any symptoms referrible to the stomach, there being commonly no, sickness, or, pain in taking food.

From what has been said, it may be inferred that the diagnosis of carcinoma of the stomach is often very obscure. When we have great pain in the region of the cardiac orifice, connected with the act of swallowing, and subsiding after the food has apparently entered the stomach, we may, in the absence of any assignable cause, suspect malignant disease of that ostium; which suspicion will be confirmed if there is vomiting of mucus, coloured with a coffee-ground-looking substance; and if added to this there be hardened glands in any part of the body. When again there is pain about half an hour after taking food, followed by sickness, and vomiting of coffee-ground matter, with general emaciation, and pains between the scapulæ, we may suspect similar disease of the pylorus; and we ought carefully to examine the epigastric region, where, if the disease exist, we shall, sooner or later, detect a tumour occupying the situation of the pylorus; and we shall also often find enlarged and scirrhous glands in the groins or axillæ. When the disease is in the large curvature of the stomach, there will, from the absence of symptoms, be still greater obscurity, the first sign being often a tumour in that situation, and we shall be driven to form our diagnosis mainly by a method of exclusion: that is to say, from the absence of the symptoms of disease of any other organ in that situation.

There is another form of disease of the stomach which has been by many authors included amongst the malignant affections of that organ, namely, the so-called scirrhus of the pylorus, which includes every variety as to degree of malignancy; the simplest form consists in thickening of the mucous and areolar tissues, with hypertrophy of the muscular, occasioned probably by its being thrown into more continuous action by the irritability of the overlying membranes, which induces an induration and thickening which may be compared to permanent stricture of the urethra. The symptoms of this stricture of the pylorus differ little or nothing from those of malignant disease in the same situation. It differs, however, in this, that it is not generally associated with malignant disease in other parts. This growth may be, no doubt, of a simply fibrous character, though in the majority of instances the nucleated fibres resembling the recurrent or semi-malignant growths enter into the composition of the tumour: in other cases, again, the growth is of a more truly malignant character, and involves neighbouring strictures; and sometimes remote parts are found similarly affected.

Obstruction in this situation is often (though not constantly) attended by great enlargement of the stomach, and with pain at an interval of from half an hour to two or three hours after taking food. This pain extends between the scapulæ, and terminates with a copious vomiting of yeasty matter, generally containing vibriones and sarcinæ. When the disease is fully established it will generally show itself in the form of a somewhat cylindrical tumour; though the presence of such a tumour is not always conclusive, since a growth external to the stomach may produce pressure and consequent obstruction, and also present the same sensation, as pyloric disease, to the hand of the observer.

The causes of the true carcinomatous disease of the stomach are no doubt the various irritations which would, in ordinary subjects, produce chronic gastritis; but in these in whom there exists the constitutional liability to these heterologous formations, such causes excite them in this particular part. They are more likely, too, to occur in advanced life; that is to say, when the powers of healthy nutrition begin to decline: thus they most frequently occur after the age of fifty in men, and after the cessation of menstruation in females. The stricture of the pylorus, on the other hand, though no doubt more common in elderly persons, is by no means confined to such subjects, but is sometimes met with in persons between twenty and thirty. It is probably excited by the presence in the stomach of irritating matters, whether in the form of ingesta or its own secretion; *e. g.*, in experiments upon rabbits made by Dr. Lewis with antimony, the "pylorus was frequently so thickened and indurated as to resemble cartilage under the knife." The general termination of these diseases is from inanition, owing to the stomach being unable either to receive or to retain nourishment: but in the truly carcinomatous affections, the fatal termination by asthenia is accelerated by the influence of the malignant infection upon the whole system. Malignant disease of the stomach sometimes ends suddenly by perforation and consequent extravasation into the peritoneal cavity. In those cases of stricture of the pylorus, which are of questionable malignancy, death is caused solely by inanition.

The treatment of these diseases can, at the best, be only palliative; much, however, may be done, by obviating all causes of irritation, towards relieving the sufferings of the patient and prolonging his life to the utmost. In the first place, the food which is taken should be of very small quantity, and of the quality least likely to be either chemically or mechanically irritating; and in the earlier cases nearly the same dietetic rules must be observed, as will be laid down when treating of dyspepsia. In the more advanced period much suffering will often be avoided, and the patient may obtain tolerable nourishment, if he be restricted entirely to a diet of lime-water and milk, with a little stale bread, which should be softened in the liquid. The lime-water may be mixed with the milk, either in equal parts, or in the proportion of two parts of the latter to one of the former, and the mixture may be taken either *warm* or cold, as may be most grateful to the patient; but it should never be used *hot*, that is to say warmer than 100° Far^{t}. The patient should never take more than three ounces at a time, but otherwise there need be little restriction, as to quantity, beyond his own feelings: nearly a quart of milk is sometimes taken in this way in the course of twenty-four hours. When even this or any other bland nourishment causes much pain or sickness, we must endeavour still further to spare the stomach by helping the nutrition of the body by enemata of animal broths. As regards internal remedies we cannot do much. In the less advanced stages bismuth in small doses often relieves the pain and sickness (the form either of pill or powder is to be preferred); another remedy, which often allays the sickness, is the ext. of nux vomica, made into a pill, with ext. of conium (F. 52).* When the bowels do not act, which is often the case, we must not run the risk of offending the stomach by aperients taken by the mouth (unless it be the addition of about one-third of a grain of ext. of aloes to each pill), but relieve them by aperient enemata.

Hæmorrhage from the stomach is not an uncommon occurrence, and may arise from various causes.

(1.) It may proceed from ulceration, caused either by chronic gastritis or malignant disease. In cases of ulceration the hæmorrhage may proceed either from a number of minute vessels exposed by the ulceration, or from a large vessel either of the stomach or some other viscus, to which it has become adherent: or from a considerable extent of the internal surface of the organ which has become to such a degree congested, that the capillaries have given way. This congestion is generally the effect of mechanical obstruction to the return of the blood through the portal vein arising from disease in the heart, lungs, or liver.

(2.) It may arise from similar congestion, though perhaps of a more active character, arising from the suppression of other sanguineous discharges, as hæmorrhoids or the catamenia: of the latter it is often vicarious.

(3.) Hæmorrhage from the stomach may also occur from changes in the blood itself by the disintegration of the corpuscles, by which the hæmatosine is dissolved in the serum, and in this condition is susceptible of transudation without any rupture of the walls of the vessels.

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* (52) ℞ Ext. Nucis vomicæ, gr. i.
Ext. Conii, gr. xii.
Fiant. Pil. vj., sumat i. ter die.

It is important to bear in mind the probable causes of gastric hæmorrhage as a guide to diagnosis. The diseases, or diseased conditions which may be mistaken for it, are hæmoptysis or hæmorrhage from the lungs, and vomiting of blood, which has been swallowed from any other source. Ordinary hæmoptysis, when there is considerable cough, and the blood florid and not in very large quantities, and mixed as it generally is with the mucous expectoration from the lungs, cannot readily be mistaken for gastric hæmorrhage; but when the blood is in very large quantities, it is apt to be swallowed, and thus rendered black in the stomach, and afterwards vomited, in which case we shall really have hæmatemesis or vomiting of blood, but not gastric hæmorrhage; and on the other hand, when the hæmorrhage from the stomach is abundant, it may produce irritation about the glottis, and some of it passing into the larynx will excite coughing. Hæmoptysis, however, is generally preceded by dyspnœa and cough, and frequently by pain referred to the sternum; whereas hæmatemesis is generally ushered in by weight and pain at the epigastrium; and as the hæmorrhage into the stomach generally takes place some time before the rejection of the blood by vomiting, we have pallor and a tendency to fainting preceding ejection, which, though they may attend or follow hæmoptysis, rarely precede it by any considerable interval. In hæmatemesis the blood is commonly expelled in a large quantity at once, after which the discharge ceases, for a time at least; whereas at the close of profuse hæmoptysis, blood almost always continues to be *coughed* up in small quantities for some time. Blood may also be swallowed from the nares or fauces, especially during sleep, and being vomited afterwards, may simulate hæmatemesis; but a careful examination of the parts will generally detect the source of fallacy.

An inquiry into the previous symptoms will also aid us, not only in forming our opinion as to whether the hæmorrhage is really gastric, but also as to its character, if it be such. Thus the history of previous chronic gastritis, or of the burning sensation in the epigastrium which has been stated to accompany ulceration of the stomach, may suggest the belief that the bleeding is from an ulcer. Of the causes which produce mechanical venous congestion of the mucous membrane of the stomach, some, such as disease of the heart, may produce also engorgement of the lungs, and hæmoptysis; but in such cases the dyspnœa is urgent, and we have the signs of pulmonic apoplexy, nor do we often have copious hæmoptysis from this cause. Obstruction to the portal circulation from cirrhosis of the liver is a very common cause of hæmatemesis, which, when not very profuse, may be considered as a salutary relief under such circumstances; and we may be guided in our diagnosis by the previous history and present symptoms of that disease. The hæmatemesis may always be suspected to be vicarious of menstruation when it occurs in young females, without any other lesion which may account for it, and may be pretty certainly inferred to be so when we have a history of uterine irregularity.

The prognosis of hæmatemesis must depend much upon its probable cause. When we have reason to believe that it proceeds from ulceration, the prognosis is unfavourable, and it is so in the highest degree if that ulceration be malignant. When the hæmorrhage is from mechanical venous congestion, the prognosis will depend mainly upon the disease which produces that congestion; and, amongst such diseases, if we believe the case before us to be one of cirrhosis, although there is the highest probability of an ultimate fatal termination, yet with respect to the hæmatemesis, we may regard it in a great measure as conservative, and give a favourable opinion as to the more immediate consequences. Hæmatemesis as vicarious of menstruation need occasion no immediate apprehension beyond that of the possibility of it arising from ulceration, or being likely to lead to it.

Connected with gastric hæmorrhage, and generally a consequence of it, is the passing of the copious dark pitchy stools, commonly known by the name of melæna, consisting of blood, partly digested, and changed by its passage through the intestines; sometimes, but rarely, the blood which is poured out into the stomach is not vomited, and the whole of it makes its appearance in this form. Melæna may also arise from hæmorrhage taking place into the small intestines, either from congestion near the stomach, and produced by nearly the same causes as gastric hæmorrhage, or into the ileum, as a consequence of ulceration of that part of the canal.

The treatment of intestinal hæmorrhage must be regulated mainly by our own knowledge of its cause. When it is of an alarming and dangerous character from malignant disease, and even from simple ulceration,—and upon the latter point there must always be some uncertainty,—we may have recourse to powerful astringents, of which the gallic acid is perhaps the most to be relied upon (F. 53).* Turpentine has also been much recommended: it may be given in doses of from fifteen to twenty minims every three or four hours, or oftener. In cases of hæmorrhage from congestion, the hasty use of astringents is not only useless, but mischievous; we must, in such cases, first endeavour to remove the accumulated blood from the intestines, and at the same time aid the attempt which nature is making to relieve the portal congestion; for this purpose purgatives may be employed: indeed, in cases of hæmatemesis and melæna of this character (and they include a very large proportion, especially amongst the intemperate), we can do nothing by any other means until the bowels have been well cleared out. For this purpose we may, in the first instance, give a moderate dose of colocynth and calomel, and aid its operation by a terebinthinate enema; after these have operated freely, a steady action must be kept upon the bowels by sulphate of magnesia with sulphuric acid (F. 54),* to which may be added a little alum; cold drinks should be used, and soft and light nourishment must be employed, and taken cold. We must remember also, in the majority of such cases, that we have to deal with those who have used stimulants largely: therefore, when there is much exhaustion, we must allow wine or brandy; port wine is generally to be preferred. The cases which occur in connection with suppressed menstruation will be best treated by aloetic purgatives and iron (F. 55),† or after the bowels have been well relieved, the tinct. ferri. sesqui chlor. may be employed in doses of about fifteen minims.

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* (53) ℞ Acidi Gallici, gr. iv.—v.
Ext. Gentian, gr. ii.—iv.
Ft. Pil. i. vel. ij.; 3^{ia} vel 4^{ta} quàq.: horâ sumend.

Or, it may be given in solution, thus—
℞ Acid. Gallici, gr. v.
Acid. Acetici dil. ʒ ss.
Syr. Aurant, ʒss.
Aq. puræ, ʒ x. Misce.
Ft. Haust.

The hæmorrhage from the stomach arising from disorganization of the blood corpuscles, commonly occurs in connection with purpura, and must be treated accordingly.

As a consequence sometimes of chronic gastritis, but often to all appearance independently of it or of any structural disease of the stomach, we meet with the troublesome train of symptoms known by the term dyspepsia. Now, although digestion is a complicated process, it is in reality not so mysterious a one as used to be supposed before it was elucidated by the labours of organic chemists, amongst whom in this country we are especially indebted to Dr. Prout and Dr. Bence Jones.

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* (54) ℞ Mag. Sulph. ʒ i.—ii.
Acid. Sulph. dil. ♏ x.
Aluminis, gr. x.
Syrupi Papav. ʒ ss.
Infus. Rosæ co. ℥ xiss. Misce.
Ft. Haust. 4^{tis} horis sumend.

† (55) ℞ Ferri Sulphat, gr. iv.
Extracti Aloes, gr. iv.—vj.
Saponis mollis, gr. iv.
Ol. Menth. pip. ♏ j. Misce.
Ft. Pil. iv., sumat j 4ter quotid.

When the stomach is thus kept in a state of passive congestion, by disease of the heart, lungs, or liver, the secretion of gastric juice is diminished, and the stomach can digest less food, and requires longer intervals of rest. If, under these circumstances, indigestible or too much food be taken, some of it remains undigested in the stomach, and may irritate or inflame the mucous membrane. The action of mercury, of diuretics, or any stimulating medicines, should be carefully watched.

XVIII.

DYSPEPSIA.

Dyspepsia (in other words, difficult, or painful, digestion, is a somewhat vague term, used to express the multifarious and often distressing symptoms produced by a defective performance of that function.

These symptoms are so variable, and so uncertain in their combinations, that the more prominent ones appear each to require a separate notice.

Anorexia, or loss of appetite, may arise from a variety of causes, the nature of which must be as obscure as is that of the appetite itself, which has given rise to so much speculation amongst physiologists. But whatever may be the immediate cause of hunger, it no doubt arises primarily from a want, in the system, of those materials which are necessary to repair the waste, or rather consumption, that attends every operation in the living body. These materials may be divided into two great classes—the nitrogenized substances, for the supply of the consumption of albumen and fibrine resulting from the waste of tissues—and the non-nitrogenized, which supply the materials for the combustion of carbon by union with the oxygen, by which combustion the animal heat is maintained. When the aliments that have been taken into the stomach have been dissolved and distributed throughout the system, there will, before they are entirely consumed, arise the feeling of hunger, if the stomach be empty, and the organs of digestion healthy. We have used the term "dissolved" advisedly, since, as Dr. Bence Jones has well remarked, there is no such thing as chemical transubstantiation in the process of digestion; that is to say, the nitrogenized or albuminous substances cannot be supplied without an injection of such substances ready made in our food: neither can the stomach from carbonic acid and water, which exist everywhere around us, so put together the carbon, oxygen, and hydrogen as to form fatty matters, starch, and sugar—the non-nitrogenized alimentary substances. All that the digestive apparatus has to do, in the animal, is to dissolve them together with the requisite earthy and saline matters, that they may be sent through the lacteals, the lungs, the heart, and the blood-vessels, to the different parts of the system.

It is probable, however, as is observed by Dr. Handfield Jones, that the solution of proteine compounds is not completed in the stomach, but goes on throughout a large extent of the small intestines.

Now, as the non-nitrogenized substances are intended mainly for the supply of carbon and hydrogen to support the eremakausis by which carbonic acid and water are being continually formed and exhaled by the lungs; it must follow that when this process is greatly impeded,—as, for instance, when the pulmonary circulation is obstructed, by disease of the mitral valve, or old capillary bronchitis, or when there is general venous congestion from feeble circulation,—we have loss of appetite. And the same thing occurs in respect to the nitrogenized substances when there is a disturbance of the capillary circulation, and consequent suspension of the vital functions, in fevers. Whatever, therefore, materially embarrasses either the pulmonic, or systemic, circulation, will destroy the appetite. For similar reasons, if the different excretory organs, especially the skin and the kidneys, be disordered, the same result will ensue: or if there be not loss of appetite, there will be delayed solution and absorption, and consequently, pain from distension, when the first stage of digestion has been completed.

In addition to these causes of impaired appetite, we may also have lesion of innervation. The nervous communication between the brain and the stomach, or, which is more common, the brain itself, may be so disordered in its action that it does not correctly indicate the impression which it should receive through these nerves; and therefore, there may be loss of inclination for food, and even aversion to it, from slight cerebral disturbance; and it is an old remark that mental emotion, as grief or anxiety, immediately destroys the appetite. On the other hand, irritation at the roots of the nerves communicating with the stomach, will often excite a craving or a ravenous hunger, and this is not uncommon in chronic disease of the brain. Excessive appetite may also exist when the stomach is able to digest well, and the chyle is taken up by the lacteals, but its progress arrested by disease of the mesenteric glands, pressure upon the thoracic duct, or in the course of the lacteals.

Nausea and vomiting are very common and very troublesome symptoms in dyspepsia. These may occur at various intervals after the taking of food, and sometimes there is a sudden vomiting or rejection of the food without any previous nausea: in other cases, again, there is continual nausea without vomiting, and this may be almost incessant, even though little or no food be taken. Sometimes there is continual nausea and retching, mucus, and afterwards yellow bile being expelled by the excessive action of the stomach, and duodenum. This vomiting is generally connected with a morbid irritability, the cause of which is very obscure: setting aside structural disease of the organ itself, it sometimes arises from hyperæmia of the stomach from obstructed circulation through the heart, lungs, or liver. It is also in some instances the effect of a lesion of innervation produced by slight cerebral disturbance; and in some cases, again, we are unable to assign any antecedent cause for this condition, and are obliged to regard it as primary affection.

Flatulence with eructation, or belching, is another consequence, and a most unpleasant one, of impaired digestion: in many instances it is produced by the evolution of gases generated by the fermentation in the stomach of the food which, by being detained there, undergoes much the same changes which a similar mass of organic matters would do if placed in a bag, and kept moist, at the same temperature. Sometimes, however, this gas appears to be secreted by the stomach itself, for some persons suffer from it when that organ is empty, and are particularly liable to be troubled by it when a meal is delayed beyond the accustomed hour. When the eructations are produced by the decomposition of the food in the stomach, they will often be most offensive, even to the patient himself, sometimes suggesting to him the idea of rotten eggs or foul drains, from the amount of hydrosulphuric acid evolved. In this case, too, the gas often brings with it fluid, or a portion of the solid matters in the stomach, as though the patient were ruminating. These matters which are thus belched up are often intensely acid, partly so from the acetic acid generated by the fermentation, partly perhaps by the irritated stomach secreting more than a usual amount of hydrochloric acid.

Pain, in or about the region of the stomach, is a frequent though not constant symptom of indigestion. A common form in which it often presents itself is that popularly known as cardialgia, or heart-burn. In other cases, again, there is a more severe and violent pain coming on in paroxysms, which has been termed by nosologists gastrodynia, and, popularly, cramp in the stomach.

The heart-burn is a sense of heat in the region of the stomach, generally towards the left side, often attended with eructation of acid matter. When it occurs, as it frequently does, soon after meals, it is probably the result of acid, either acetic or lactic, produced by fermentation; but sometimes it occurs when the stomach is empty, and the uneasy feeling is often relieved by taking food; this, in all probability, depends upon an excessive acrimony of the fluids of the stomach itself.

Sometimes, again, there is pain in the stomach immediately after taking food, which continues until it is relieved by vomiting. This in the majority of cases arises from chronic inflammation of the stomach, or undue irritability about the pylorus or duodenum, generally of a subacute inflammatory character. In some instances, however, there is continued increasing uneasiness, until at last vomiting takes place without any apparent irritability, but rather from a loss of tone of the stomach combined with the arrest of the natural changes of the food, the ingesta consequently remaining nearly unchanged, except by fermentation, until expelled by the combined efforts of the diaphragm and abdominal muscles. These cases are most frequent in females.

A very frequent complaint, but one which seems not to have been much noticed by authors, is of pain coming on about twenty minutes or half an hour after a meal; the pain is of a dull aching character, often extending through between the scapulæ, and accompanied with a very uneasy feeling of distension, and sometimes flatulent eructation. The tongue in this case is generally clean, though it may be indented at the sides by the teeth; the appetite is not generally much impaired, the patient sometimes saying that he could eat if he were not afraid of the subsequent pain. The uneasiness in this case appears to depend upon delay of the food in the stomach, owing, perhaps, to a want of the proper solvent; and it may be also from a want of nervous power.

In other instances the pain does not begin till two or three hours after a meal; but continues for several hours. Dr. Abercrombie was of opinion that the cause of this pain was excessive irritability or subacute inflammation of the duodenum. Dr. Watson, however, holds, and with apparent reason, that the seat of the pain cannot be so near the stomach as the duodenum; since, in that case, it would commence earlier, and believes it to arise from excessive secretion of acid in the small intestines. It should be remembered, however, that the transit through the small intestines, especially of all matters not absorbed by the lacteals, is extremely rapid.

Pain again attacks the region of the stomach in some instances in violent paroxysms, accompanied with great flatulent distension. This form of pain, to which the term gastrodynia has been applied, is most common in hysterical females, often shooting between the shoulders, and sometimes extending over the whole abdomen; it may, however, occur in all subjects, especially those whose bowels are apt to be constipated. In such cases it is produced in all probability rather in the colon than in the stomach. Sometimes, again, we have *spasm* of the stomach, as it is termed, perhaps correctly, in persons of a gouty diathesis: this so-called spasm is no doubt in many instances nothing less than incipient gouty inflammation, which, if it be not arrested, may speedily prove fatal.

Pyrosis, or *water-brash*, is another troublesome concomitant of dyspepsia, though it is said sometimes to occur without any derangement of the digestive functions. It consists of pain and contraction across the scrobiculus cordis, generally reaching through between the shoulders, and increased by raising the body to a perfectly erect attitude. This pain generally comes on when the stomach is empty, and after it has lasted some time there is an eructation of a thin watery fluid, which is often brought up in very great quantities. There is generally much derangement of the digestion in pyrosis, which is perhaps no more than might be expected from the quantity of the fluid diluting the natural gastric juice, and rendering it no longer a fit solvent for the food. The cause of the pain is not so obvious, but it is possible that it may be produced by distension from hyperæmia, which is eventually relieved by the exhalation, from the mucous membrane, of this excessive secretion. Sometimes the secretion takes place in great quantity, just as the patient is about to commence a meal. In one instance an elderly gentleman was unable to commence his dinner till he rejected a large quantity of this fluid. Pyrosis may be symptomatic of organic disease of the stomach; it may also be produced by pressure from neighbouring viscera; and water-brash, with severe dyspeptic symptoms, is one of the forms of disorder to which the curriers, who in their work are exposed to great pressure on the epigastrium, are exceedingly liable.

Constipation, or rather costiveness, is at once a frequent concomitant, and cause, of dyspepsia: in some instances, no doubt, the liver may be at fault, and the diminished flow of bile into the duodenum may be one cause of languid peristaltic action of the intestines, which may also delay the contents of the canal above, and thereby disturb the action of the stomach.

Besides these disorders, directly referable to the digestive organs, there are others which more affect distant parts. There is almost always, to a greater or less extent, a loss of vigour both of body and mind, the muscles wasting, and becoming flabby from defective power of repair, and the brain losing its wonted energy, from a want of its accustomed supply of healthy blood; but, as is generally the case when the tonicity of the system is impaired, there is an excess of excitability, though the functions of the nervous matter may not be so steadily and uniformly performed. Accordingly there are frequently irritability of temper, great restlessness, and no steadiness of purpose; or there may be that lamentable condition approaching almost to insanity, commonly known as hypochondriasis, in which the patient is in a state of incessant despondency, respecting either his health or his affairs; or it may be about his family, or the safety and prosperity of his country: but whatever be the object of his interest, it is also that of his most unfounded apprehensions—the *metus ex causis non æquis* of Cullen. The nerves of sensation are also easily excited, and we often meet with pains in the thorax, or across the epigastrium. Headache is also a common symptom, as are also vertigo and confusion of sight. The tongue is generally coated, the bowels irregular, and flatulence is commonly a troublesome symptom. The pulse is often irregular or even intermittent, and frequently there is palpitation. These symptoms, together with the pain in the left side of the chest, excite great apprehension of disease of the heart.

As dyspepsia consists essentially of defective performance of the functions of the stomach and parts immediately connected with it, it may be induced by structural diseases of these parts, and therefore the diagnosis between such diseases and simple dyspepsia must depend upon the presence or absence of the signs of the structural changes alluded to. Besides this, it closely resembles subacute gastritis in many of its symptoms; but from this it may be distinguished by the pain when it occurs not coming on immediately upon taking food, but after an interval of twenty minutes or more.

The causes of dyspepsia are very various. A common one is anxiety, or, great mental occupation, with, little exercise, and sedentary habits, especially if the latter be attended by confinement in close rooms or offices. Indulging too freely at table,—eating too quickly,—and resuming active occupation of body or mind too soon after a full meal,—allowing too short as well as too long an interval to elapse between meals—an imperfect performance of the functions of the skin, for the connection between the mucous membranes and the skin, of which the latter is but a continuation, is so close, that the former cannot reasonably be expected to continue in healthy action unless the latter be so likewise—an injudicious selection of articles of diet, both as regards their chemical and physical properties.

In the treatment of dyspepsia the first object must be to obviate, if possible, the circumstances or conditions which have induced the disturbance of the functions of digestion; and secondarily to palliate or counteract the ill effects and inconveniences arising from this disturbance.

Now, the first principle in the management of disease of all kinds is to give as much rest as possible to any irritated, inflamed, or feeble, organ; and this applies to the stomach as much, at least, as to any other.

The first rule then must be to insure the stomach not having too much food put into it at a meal. Dr. Abercrombie well remarked that we are apt to err quite as much in the quantity as in the quality of our food, or even more. Another important one is to give time for the stomach to rest after digesting a meal. In general, from four to six hours should intervene between one meal and another. When a person in good health has taken a hearty though moderate meal, including animal food, he can well go on for six hours or more, and even though actively engaged, he will hardly be ready for another within that time. When, indeed, the food has been of a light simple kind, bread, or bread and milk, or bread and butter with tea, or coffee, the stomach will have sooner emptied itself, and be sooner ready for the reception of more food; and therefore, Mr. Abernethy's rule of six hours, which allowed from four to five for digestion, and one for rest for the stomach, was a very fair one for the interval after a full meal: but with feeble persons, and after a meal of soluble food, the stomach would be empty, and after a time exhaustion will succeed much within this period. For persons who take very light and very soluble food, four hours is perhaps a sufficient interval. Nothing, however, can be more obviously absurd than, putting one meal into the stomach, before the former one can have been converted into chyme, and have passed the pylorus; and thereby requiring the stomach to supply gastric juice for substances in different stages of solution. For similar reasons a variety in the articles of food must be bad, and also, because the use of several dishes affords a series of fresh stimuli to the appetite and induces the taking too much. Persons who are politely said "to be fond of the pleasures of the table," are almost always dyspeptic.

It is next to impossible to lay down particular directions for the diet of persons in health; still more so for those who are the subjects of dyspepsia, since some persons are made exceedingly ill by articles of food which are for the generality of people wholesome, and others can best use those which are to most persons the reverse. Thus, one lady could never, without undergoing the greatest inconvenience, eat any of the rhomboidal fishes, and another of apparently very irritable stomach could live comfortably upon salmon.

When the dyspepsia is dependent upon chronic inflammation of the stomach, there can be no doubt that butcher's meat should be abstained from, and that the diet should consist of a little white meat, as chicken, or white-fleshed fish, and farinaceous food; and where the irritability is great, of the latter entirely, with the addition of milk, which, however, does not suit all stomachs.

Of butcher's meat mutton is the most readily digested, and furnishes perhaps the greatest amount of nourishment in the least bulk. Bread again, it should be remembered, is the true *pabulum vitæ,* as it contains all the materials, both non-nitrogenized aud nitrogenized, required for nutrition; but in an undissolved state, and therefore requiring the trituration of mastication and the addition of some solvent in the way of drink, so that bread is the normal solid nourishment. Milk, on the other hand, contains the same materials ready dissolved, so that it is the normal liquid nourishment, and is that provided by nature for infants, who take no additional liquid for a solvent. Bread, therefore, is the substance which of all others is best suited for weak digestive powers; but if it remain too long in the stomach it is prone to fermentation, whereby acids are generated and gases evolved. Animal food, which should consist of well-roasted or boiled flesh, fowl, or fish, is perhaps as readily chymified as any; but there certainly appears to be required a certain amount of activity in the powers of life, and free action of the excretory organs, especially the skin, that meat may be well digested: this is only compatible with a considerable amount of exercise in the open air; as otherwise the tongue becomes loaded, the breath offensive, the urine foul from urates, and if there be not headache or sickness, the appetite fails, and offensive eructations take place; the mixed diet is, therefore, most suitable for the generality even of dyspeptic persons, provided there are not many ingredients in the mixture. Vegetables again, such as potatoes and green vegetables, are liable to acetic fermentation in the stomach, and thereby cause acidity and flatulence, when not taken in very great moderation by dyspeptic persons; but when omitted altogether, a state akin to purpura is induced, in which the stomach, with other organs, eventually suffers from the diseased state of the blood. It appears, then, that though a person could live better upon bread than upon any one single article of food, a mixed diet is, in general, to be preferred, provided that the mixture be not too complex.

In all articles of diet the physical condition should be considered, and therefore those which are soft and in a state ready for solution are the most eligible for weak stomachs; those, on the other hand, which are rendered hard by artificial processes, as preserved and pickled meats, ham, &c., are to be shunned. Meat is as digestible roasted, as dressed in any other way, perhaps more so, as boiling produces a hardness on the outside which may be irritating to dyspeptic stomachs, particularly when the affection is dependent upon subacute gastritis.

As regards liquids, it is probable that most dyspeptic persons take too much of fermented drinks, and the majority of such should abstain as much as possible; though there are cases in which a moderate use of wine, beer, or spirits, acts as a wholesome stimulus to the feeble stomach. As Dr. Watson well remarks, it is impossible to lay down any specific rules upon this subject, but that liquid should be selected which causes the least heat and irritation. Where there is a tongue with red edges, most alcoholic drinks will have this effect, and then it is better to abstain altogether.

Next to the excessive use of ardent spirits, there are few things in regard to which people make so free with their stomachs as in the matter of tea and coffee; that they are most grateful nervine stimulants cannot be doubted, and also that they are of great service by obviating the use of more pernicious beverages; but the large quantities which some persons take must, by diluting the fluids of the stomach, impede the process of digestion; and it is certain that those who are liable to painful distensions of the stomach after meals, have them much aggravated by tea in any considerable quantity. The proper quantity of fluid to be taken can hardly be defined by any certain rule; but for most persons about three pints in the day are necessary, and more than that is injurious. As regards liquid, or dissolved nourishment, it is not best suited for most dyspeptic subjects: but on this point we must be guided mainly by experience in each individual case; and some very irritable stomachs are offended by any solid food. When this is the case, lime water and milk in proportions varying from equal parts of each to two of the latter to one of the former, will often be found soothing, and at the same time nutritious.

In the selection of medicines as well as of dietetic remedies we must be guided, in great measure, by the symptoms which are most prominent among those which we have already described.

In the sickness of dyspepsia we find a great uncertainty in the effect of remedies. In many cases carbonic acid, either in the form of effervescing draughts or soda-water, have a very marked effect; in others, the mineral acids, especially the sulphuric, in infusion of green mint. But in a still greater number of cases, the alkalis, as liquor potassæ, or carbonate of soda, are more effectual, particularly the combination of the latter, in a draught, with three or four minims of the dilute hydrocyanic acid of the Pharmacopœia. Creosote is a doubtful remedy, and is nauseous to swallow, and still more nauseous to vomit up again. A very efficacious remedy is strychnia (F. 56),[*] in doses of from a 32nd to a 24th part of a grain. Bismuth is often serviceable in allaying sickness: to this remedy, however, we shall again revert.

What is, however, of most importance, is a careful restriction of the quantity put into the stomach, and more particularly the avoidance of taking food too frequently. Where the irritability is great, a good plan is to limit the patient to a large coffee-cup of milk and lime water about every three hours; and when the irritability diminishes, to allow a small quantity of meat (roast mutton, or a chop) in the middle of the day. The bowels should also be kept open by an aloetic pill. Dr. Watson relates a case of chronic vomiting successfully treated in this manner; and a similar case in Guy's Hospital was as speedily relieved by a careful, though not so strict regulation of the diet, and the use of the aloetic pill thrice a day, with the addition of a quarter of a grain of extract of nux vomica. The loss of appetite, when the tongue is foul, will first require the clearance of the intestinal canal by a dose or two of rhubarb and blue pill, followed, if necessary, by a gentle aperient draught. If, however, the bowels are irritable, a combination of rhubarb with an opiate is preferable (F. 57);* after this, the diet should for a time be of the simplest and least irritating kind, and it is a great mistake to solicit it by highly-seasoned dishes; on the contrary, we may more frequently *starve* persons to an appetite by a very sparing diet. Where there is simply defect of appetite, the bitter tonics, with the addition of the mineral acids; or, when the bowels are rather torpid, one of these bitters with compound decoction of aloes, may be administered: but what is far better when attainable, is a good walk or ride in the open country, with occasional relaxation of mind, and change of air and scene.

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[*] (56) ℞ Strychniæ, gr. $\frac{1}{4}$—$\frac{1}{3}$.
Acid. Acet. dil. ʒ ij.
Aq. distillat. ℥ iv. Misce.
Sumat coch j. ampl. 4^{tis} horis.

Flatulence, again, is another symptom requiring careful diet, as it is often the consequence of errors in this respect, either as regards quantity or quality. When the flatulence is attended by the "rotten-egg" eructation, there is probably undigested animal matter in the stomach or duodenum, and as long as this occurs the diet should consist of light farinaceous substances. Flatulent eructations and distensions will, however, sometimes occur spontaneously, or when, with a weak stomach, the interval between meals has been unusually long. When this is the case, a careful regulation of the times of taking food is necessary. This flatulence is often speedily removed by some aromatic water, as peppermint or dill, or a few grains of calcined magnesia, with about half a drachm of tincture of cardomums in water: that which follows meals will generally be best obviated by swallowing, about half an hour before each meal, a pill composed of two grains of extract of rhubarb, with four of nitrate of bismuth.

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* (57) ℞ Pulv. Rhei, gr. xv.
Pulv. Cretæ co. cum Opio, gr. x.
Aq. Menth. pip. ʒ x. Misce.
Ft. Haust.

The pain in the stomach which precedes meals, and is sometimes relieved by taking food, is often removed by a small quantity of calcined magnesia; but that which immediately follows taking food is less tractable, as it commonly depends either upon subacute inflammation of the mucous membrane or organic disease of the stomach, and must be combated by the means best adapted for those affections. Small doses of the nitrate of bismuth, either in pill or in combination with hydrocyanic acid, will, however, often palliate it, as will also the nitrate or oxide of silver, in doses of about one-third of a grain.

The pain, again, which follows at a short interval after taking food, and is often unattended by any other manifest gastric derangement, the tongue being generally clean, is best relieved by the nitrate of bismuth, taken about a quarter of an hour before meal times. It may be taken either in the form of pill with the extract of rhubarb, or suspended with mucilage in a draught, and a few minims of dilute hydrocyanic acid may be added. That which follows taking food, at a longer interval, will often be prevented, when it does not depend upon any organic cause, by taking a small quantity of an alkali about an hour after a meal; and of these a fixed alkali, in the form of liquor potassæ, or liq. calcis, is the most effective, perhaps from its not causing the evolution of any gases, and sometimes fixing any acid ones that may have been generated. The mineral tonics, as sulphate of iron and zinc, are also not unfrequently useful; and here, too, as in several other painful affections in the abdomen, the bismuth will be found eminently useful. The paroxysms of pain which have been described under the term gastrodynia, are sometimes greatly relieved, or even prevented, by the action of a brisk purgative: this is, no doubt, most effectual in those cases in which there is distension in the arch of the colon, and in all affections of this description we should make sure of the free evacuation of the bowels. In many cases, however, these pains appear to be purely neuralgic, and are very common in hysterical females. They are then often relieved by mustard poultices applied to the pit of the stomach, by the combination of æther and opium, provided the bowels have been satisfactorily emptied, and by prussic acid.

Water-brash is often a very troublesome complaint, and, in some constitutions, the secretion of an enormous quantity of fluid has become such a habit of the mucous membrane of the stomach, that it is next to impossible to arrest it. Astringents combined with opium will, however, often check it, and amongst these, the pulv. kino comp. of the Pharmacopœia is extolled by Dr. Watson. The mineral astringents, as bismuth, nitrate or oxide of silver, and oxide of zinc, are also very serviceable, and still more so when combined with extract of nux vomica, or very minute doses of strychnia (F. 58).* The opium will often have the effect at first of increasing the tendency to constipation which ordinarily exists, though, after a time, this effect of the drug will generally cease. When, however, there is occasion for an aperient, the compound rhubarb pill may be employed, or equal parts of compound colocynth pill and soap. The same remedies will be found effective when costiveness is the prominent symptom of dyspepsia; or a mild dinner-pill may be employed.

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* (58) ℞ Ext. Nucis Vomicæ, gr. jss.
Argenti Nitrat. gr. ij.
Ext. Lupuli, gr. xii. Misce.
Fiant. Pil. vj. è quibus sumat j. ter die.

Or, ℞ Bismuth Nitrat. ʒ ss.
Strychniæ, gr. $\frac{1}{4}$.
Ext. Papaveris, gr. xii. Misce.
Fiant. Pil. vj. è quibus sumat j. ter die.

XIX.

PERITONITIS.

Like all other serous membranes, the peritoneum is liable to inflammation. This inflammation may be acute or chronic: it may also be idiopathic or secondary, common, specific, or tuberculous. Acute primary, or idiopathic peritonitis is by no means so common a disease as it was formerly, or perhaps still is, ordinarily, believed to be; yet, as this may be regarded as the typical form, a description of it is necessary with a view to the right understanding of the disease under the different conditions in which we more commonly meet with it.

Peritonitis then, as its name imports, consists in inflammation of the serous membrane, lining the parietes, and investing the viscera, of the abdomen. In its acute and simple form it presents the ordinary phases of inflammation of such a structure. At first, the membrane is dryer than in health, and the minute vessels more injected; next there is effusion of liquor sanguinis, of the fibrinous or molecular form, according to the vital powers of the patient. When this lymph is of the fibrinous character, it is generally speedily deposited upon the surface of the peritoneum in thin layers or flakes, the serum becoming quickly resorbed; these layers of lymph generally increase by fresh depositions as long as the inflammation continues, attaining every variety of extent and thickness, and forming adhesions between the contiguous portions of the membrane; so as to connect the different viscera, or portions of viscera, with one another and with the walls of the abdomen. The next stage of inflammatory effusion then takes place, and the lymph becomes organized, and the adhesions cellular and permanent: the lymph in the process of organization evincing the same tendency to contraction as in other situations. When, however, the disease occurs in subjects of less plastic power, or in whom there is a deficiency in the solid contents of the blood, the serous effusion greatly predominates; and, whilst the layers of fibrine may be deposited upon the surface of the membrane, the cavity itself becomes distended by serum, constituting one form of ascites. In some cases, again, of still feebler power, and where the lymph has been in the first instance entirely molecular, it may degenerate into pus. Such is a brief sketch of the anatomical changes produced by acute inflammation of the peritoneum in its more active form; these changes, however, may assume every variety of extent and situation. Sometimes the omentum is the part of the membrane chiefly affected, and it becomes adherent either to the walls of the abdomen or to the intestines; in some cases, by its subsequent contraction, drawing them together and partially strangulating them. Sometimes the intestines become adherent amongst themselves or to the other viscera of the abdomen, as the stomach, liver, spleen, bladder, ovaries, or uterus; and it need hardly be remarked that the functions of these organs may thereby be seriously impeded. As we have before observed that peritonitis is more commonly a secondary than a primary affection, it appears that, in the majority of cases, this disease is to be regarded as a most important intermediate link in a series of morbid action, being a very grave consequence of antecedent diseases (those of the blood, amongst others), and the antecedent or cause of others of no less importance.

The invasion of acute peritonitis is, for the most part, sudden, from whatever cause it arises; though, under some circumstances, it is almost instantaneous. It is characterized chiefly by severe pain and tenderness of the abdomen; the pain being scarcely a more prominent feature than the tenderness: so great, indeed, is the latter, that the pressure of the bed-clothes is hardly endured. The legs are drawn up to remove the pressure arising from the tension of the abdominal muscles; the breathing is extremely hurried, and is also thoracic, as the descent of the diaphragm, by disturbing the abdominal viscera, and causing a slight motion of one surface of the peritoneum upon the other, would aggravate the pain; and the suffering caused by coughing amounts at times to perfect agony. The pain, too, is often increased or induced by assuming the erect posture, or by turning from side to side. It is truly observed by Dr. Watson, that though in true peritonitis there is generally occasional remission of pain, the tenderness is constant.

It would appear from this that the tenderness is the essential symptom, and that the pain is the effect of circumstances which excite this tenderness; thus, as the intestines are at times nearly quiescent, we have an explanation of the absence of pain: but as they are liable to be disturbed, and to have their peristaltic action excited by the passage of aliment, of flatus, or even of their own secretion, or of that of the organs whose ducts pass into them, we can account for the frequent, and apparently spontaneous, accessions of pain. The varying states of distension of the urinary bladder must also produce exacerbations in the pubic region.

The pain which attends all the movements of the abdominal viscera may be regarded as the læsa partis functio, which is almost a pathognomonic sign of the disease, since the essential function of the peritoneum may be said to be the providing a smooth well-lubricated surface, to insure the painless movement, upon each other, of the contents of the abdominal cavity, and which is frustrated by the effects of the inflammation. Again, in an inflammation of the membrane, which constitutes one of the coats of the greatest portion of the intestinal tube, we naturally look to the state of the bowels; and here we find uncertain and opposite statements amongst different authors;—thus, Dr. Alison says that the bowels are obstinately costive; Dr. Abercrombie, that they are not generally affected either by constipation or the contrary; and Dr. Addison, that they are generally costive. The statement of the last-named physician will, in the main, prove to be the correct one. Inflammation of the peritoneum does not *immediately* affect the functions of the alimentary canal; there being no fresh excitement to action as in the case of inflammation of the mucous membrane, nor any diminution of the power of acting, as in the case of inflammation of the muscular coat; but there will be diminished action in order to allow of the natural reparative process: and, therefore, the bowels are generally costive, but not *necessarily*, in the early stage of the acute disease, obstinately constipated. When, however, the inflammation in this situation has lasted some time, then, as we have frequently taken occasion to remark, the muscular tissue underlying the inflamed membrane loses its contractility, and constipation ensues. The same must necessarily become the case when the muscular coat itself is involved. Sickness, which is not an uncommon symptom, is generally ascribed to inflammation of that part of the membrane which covers the stomach; but it may occur when the inflammation is in other parts of the peritoneum, owing most probably either to nervous irritation, or to the inflammation involving the small intestines, and thereby causing obstruction in that part of the alimentary canal.

The pulse, another important sign in all inflammatory diseases, presents great differences in peritonitis: thus, Dr. Addison describes it as "frequent, sometimes contracted, but nevertheless hard and resisting to the finger;" and this is about the most accurate general description that can be given of it; but it varies very much under the different circumstances of the disease, and in accordance with the principles laid down in speaking of the pulse generally (p. 73, *et seq.*). Thus in the onset of peritonitis it is hard, and generally full; there being intense inflammation, increasing at the same time the tonicity of the artery, and the force of the ventricular contraction; but circumstances may arise to obviate the latter condition: thus there may be exhaustion and shock to the system produced by the agent which excited the inflammation, by the nearness of the part affected to the expansion of the solar plexus, or even by its rapid development—and, consequently, the hardness only remaining, whilst the injecting force of the heart is feeble, the pulse may become small and hard, that is to say wiry and even thready. The fulness and hardness of the pulse both belong only to the active stage and fibrinous form, which are typical of inflammation of a serous membrane; but when the effusion is molecular, and, still more, when it has degenerated into puriform fluid, the pulse likewise loses in some measure its characteristic peculiarities, and becomes softer, approaching more nearly to the pulse of mucous inflammation; and in extreme cases of suppurative inflammation of the peritoneum it is rapid, very small, and compressible.

The state of the urine is also important in all cases of peritonitis. When the inflammation is at its commencement, and of an active character, the urine is commonly scanty and high coloured. Dr. Abercrombie states that when the peritoneal covering of the kidneys is involved, there is almost total suppression; though there is some doubt as to whether this may not arise from, the suppression and peritonitis having a common cause, rather than from, the suppression being the effect of the inflammation. The character of the urine is important also,—as should it be albuminous, it would indicate that the peritonitis is probably the effect of renal disease; and should it contain a large quantity of lithates, it would indicate the likelihood of acute inflammatory action, with probably some hepatic complication; and should it be in large quantities, and of light specific gravity, it should suggest the suspicion of some form of hysteria simulating peritonitis.

A knowledge of the causes of peritonitis is essential to the diagnosis and treatment of the disease in its various forms. It may occur as a primary affection from exposure to cold or excessive fatigue; but this is its most uncommon form; so much so, that when we meet with what appears to be a case of this kind, we must inquire most carefully into the probability of some other cause. It may also occur in its most violent and rapidly fatal, or sometimes in a circumscribed and more insidious, form, from perforation of some portion of the alimentary canal; this generally happens after there has been some evidence of disease likely to produce such perforation either in the stomach, the small, or the large, intestines, though sometimes a chronic ulcer may suddenly open into the peritoneum without any previous symptoms whatever.

When perforation of the stomach takes place, it may arise from organic disease often of a malignant character, as was the case with Napoleon Bonaparte: or it may occur after protracted symptoms of dyspepsia: or it may take place without any previous symptoms whatever; this is most common in young females, but it has been known to happen in both sexes, and in more advanced life. The peritonitis from this form of perforation is generally fatal in from twenty-four to forty-eight hours, as, from the suddenness with which it occurs, there is no time for the formation of adhesions to circumscribe the extravasated contents of the stomach. When the perforation supervenes upon protracted disease with dyspeptic symptoms, the consequent extravasation is commonly circumscribed, and thus the fatal consequences may be delayed: in one instance of an elderly man, who had been long suffering from apparently intractable dyspepsia, with great pain and distension immediately after taking food, several perforating ulcers were found in the stomach after death; but most of these opened into the portions of intestine between which and the stomach adhesion had been established before the perforation occurred. Thus one communicated in this way with the duodenum, and two with the transverse colon; whilst one opened freely into a large sac or pouch, formed by thick fibrinous lymph effused upon the surfaces of the adjacent viscera. In another case, which occurred some years ago in Guy's Hospital, there were the pain and tenderness of circumscribed peritonitis in the left hypochondrium, in an elderly female, who had before been in the hospital for what appeared to be chronic gastritis; but what was remarkable, symptoms of pleuritis speedily followed, and shortly after those of considerable pleuritic effusion, combined with which there were metallic tinkling and amphoric cough and voice, so distinctly marked as to lead those who were unacquainted with the previous history of the case to believe that a pneumo-thorax existed. Inspection after death showed a large perforating ulcer of the stomach at the small curvature through which the contents passed freely into a large pouch of false membrane, spread out upon the neighbouring viscera, the roof of which was formed by the diaphragm, through which the inflammation had extended by contiguity to the left pleura, giving rise to serous effusion in that cavity: the pouch before mentioned being distended by flatus from the stomach, produced the amphoric sounds by the succussion caused by the movements of the diaphragm in breathing, coughing, or speaking; affording a curious instance of the auscultatory phenomena, which may be produced in the abdomen.

Peritonitis may also arise from perforating ulcers in the duodenum, jenum, or ileum; those in the duodenum perhaps associated with a tendency to similar diseases in the stomach: thus in the first of the two cases just referred to there was communication by ulceration between the portions of the duodenum which are adjacent to each other. Perforating ulcers are very rare in the jejunum, and when they do occur, are probably of a scrofulous character. They are more common in the ileum, in which, especially towards the lower part, they are very apt to occur in fever. more particularly in that form which is characterized by a tendency to bowel irritation, and to which some have wished to restrict the term typhoid fever. These perforations are produced by, the ulceration of the aggregate or solitary glands, so common in that disease, and when they do take place, generally occur about the fourteenth day of the fever. The peritonitis, which is set up by the extravasation from perforating ulcers in fever, is almost always fatal in about twenty-four hours; since, owing to the want of plastic power in such subjects, there is little chance of its being circumscribed by adhesions. Strumous ulceration may arise in any portion of the intestine, and give rise to extravasation, and the same thing may occur in phthisis and dysentery. The contents of the urinary bladder may also escape into the peritoneum, either from chronic disease of that organ, or from the effects of stricture, though the latter is rare; and perforation of the full bladder by ulceration has also been known to take place, the contents of which may thus escape into the abdominal cavity, and give rise to peritonitis.

There can be no doubt, also, that inflammation of the peritoneum, to a greater or less extent, may arise from that of the other lining of the intestines, independently of that from which has been described as being produced by ulceration and perforation. Thus, acute inflammation of the mucous membrane may by mere continuity involve also the muscular and serous coats, and this is the more likely to happen when the former is excited by violent purgatives, such as some forms of quack medicines: thus more than one case has been witnessed arising from taking Morison's pills.

Peritonitis is more common in females than in males; and probably the chief reason of this being so is the frequency of peritonitis arising from affections of the uterus and its appendages. It is very likely to arise after delivery, from imprudent exposure; and perhaps partial peritonitis, giving rise to adhesion between the uterus and adjacent viscera, is a very common consequence of parturition, and is evidenced by subsequent pains, and impeded action of the bowels or bladder. There is also a more fatal disease, commonly known as puerperal peritonitis, which, however, is a specific disease, requiring a distinct notice.

Disease or irritation of the ovaries is a cause of severe peritonitis more commonly than is generally known, or at least recognized by medical authors. In one instance a young married lady who had menstruated regularly, imprudently sat upon the grass at a pic-nic party about the time that the catamenia might be expected to appear. A few days afterwards she was attacked with rigors, followed by severe pain in the left iliac fossa, where there was great tenderness; the pain gradually extended upwards, and to the right over the whole of the abdomen. To these symptoms succeeded sickness, obstinate constipation, a small, hard pulse, with paroxysms of intense suffering; in short, the patient was in a state resembling that of persons suffering from a foreign body in the appendix cæci, with the exception of the chief pain being referred to the left instead of the right side. Upon inspection after death there was found to be extensive peritonitis, which appeared to have commenced from the serous coat of the left ovary, the ovary itself being large, generally hyperæmic, and in one part containing a cyst about the size of a pea; but which was believed not to be an ovarian fœtation, of which a suspicion was entertained before death. Another instance, which was not fatal, was that of a young woman, a patient in the clinical ward at Guy's Hospital, in whom the symptoms very closely resembled those of a foreign body in the appendix; this occurred at the menstrual period, the catamenia being delayed. The disease yielded to the treatment most adapted to peritoneal inflammation in that situation; and after the action of the bowels had been restored, the catamenia appeared. If it be true, and instances might be multiplied to prove that it probably is true, that peritoneal inflammation is a possible and not very improbable consequence of ovarian irritation, the fact is important, not only in a pathological, but also in a practical and prophylactic point of view. Peritonitis may also arise from blood disease, and this is one of its most frequent causes. Thus rheumatic or gouty inflammation of the peritoneum is a possible though not very probable occurrence. It may also arise from the presence of bile in the blood; but amongst all its causes there is perhaps none more frequent than uræmia or retention of the urea in the blood, owing to disease of the kidneys.

It may also arise from the presence in the system of various morbid poisons, as of the exanthemata; and there can be little doubt that, independently of the kidney disease which is one of its common effects, the scarlatinous poison may affect the peritoneum; the same remark applies still more to erysipelas. There is, however, one specific form of peritonitis, belonging no doubt to the class of blood diseases, which is of special importance from its fatality, and from its sometimes prevailing, to all appearance, as an epidemic: this is the disease commonly known as puerperal peritonitis. The inflammation begins in the peritoneal coat of the uterus, and extends thence over a large portion of the membrane; it generally commences a few days after parturition, but appears to be distinct from the simple or non-specific peritonitis, which not very unfrequently follows that event, there being greater prostration; in fact, its symptoms from the first are of a typhoid character. It has just been stated that the disease is frequently epidemic, and what is of more importance to be remembered, it is highly contagious; so much so, that it may be conveyed through the medium of a third person; and it is no uncommon thing for a medical man who has attended a patient so affected to communicate it to the next woman whom he may deliver. The knowledge of this fact, and it is one almost universally admitted, renders it incumbent upon every medical man who has attended any one instance of it (as Dr. Watson pertinently insists), "to use the most diligent attention; he should even wash his hands with some disinfecting fluid—a weak solution of chlorine, for instance; he should avoid going in the same dress to any other of his midwifery patients; in short, he should take all those precautions, which, when the danger is understood, common sense will suggest, against his clothes or his body becoming a vehicle of contagion and death between one patient and another."

We might even go further than this, and affirm that it is the duty of a medical man, who has attended cases of this disease, and finds that it is spreading, to relinquish, for a time, his midwifery practice altogether.

Another point of scarcely less practical import, is the known relation between the poison of this disease and that of erysipelas: this is so firmly believed by many eminent obstetricians, that they take every possible pains to avoid being brought in contact with persons affected with the latter disease, lest they should infect their midwifery patients with the former. The same may be said, with almost equal certainty, of scarlatina.

When peritonitis terminates fatally, it generally does so by death from syncope, or failure of the heart's action: the pulse becomes smaller and smaller, though generally to the last rather wiry (p. 74). This sinking is almost always preceded by a cessation of the pain, which has been by many authors referred to gangrene, which, however, rarely occurs, though when it does, there is the same subsidence of pain.

The diagnosis of peritonitis consists pretty much in a method of exclusion, namely, in the presence of acute pain recurring generally in paroxysms with great tenderness, and thoracic respiration, without the evidence of inflammation of any other tissue. Unless these symptoms present themselves in an hysterical female, in whom the neuralgic pains, which closely simulate peritonitis, can only be distinguished from that disease by a careful investigation of the previous history and constitution of the patient—by the pulse wanting *hardness*—and by pressure being sometimes well borne when the attention of the patient is diverted, as by engaging her in conversation at the time of making the examination of the abdomen, we may infer that the disease is peritonitis. The peripheral pain and tenderness excited by inflammation of the spinal cord will also closely simulate the symptoms of peritonitis, though upon careful examination they may generally be distinguished. When the inflammation has extended to the muscular coat of the intestines, or when that affecting the peritoneal coat of these organs is of sufficient intensity to arrest their peristaltic action, the symptoms will closely simulate those of strangulated hernia: and a careful investigation should be instituted into the probability of such a cause for them. Where there is much sickness there will be scanty urine, and a question might arise between peritonitis and inflammation of the kidney; the state of the urine, the character of the pulse: and the sickness being, in the case of the kidneys, a more prominent symptom than the pain, or at all events than the tenderness, will greatly assist in the diagnosis.

The prognosis of peritonitis, when we have ascertained its existence, is at all times doubtful, as it is essentially a dangerous disease, the vital powers often failing suddenly, and with but little previous warning. It is not, however, necessarily a fatal disease, as the inflammation may subside or yield to appropriate treatment at any period of its course, and even when it has proceeded so far as to establish adhesions, these are not necessarily dangerous, unless they cause obstruction to the passage of the contents of the hollow viscera.

As the fatal termination of peritonitis is commonly by failure of the moving powers of the circulation, the prognosis must depend, in great measure, upon the vital powers of the patient; though these we cannot often accurately estimate: it must also be much influenced by what we can ascertain of the cause of this disease. When we can discover no assignable previous lesion as the cause of the inflammation, we must regard the peritonitis as, *per se*, though a very dangerous, yet by no means necessarily fatal, disease. The degree of danger will depend upon the probable extent of surface involved, also upon the part which appears to be most affected: thus, inflammation of the peritoneum near the diaphragm is the most likely to be attended with that rapid sinking which is one of the chief dangers in this disease. Increasing quickness with diminished volume of the pulse is always a dangerous symptom; whilst an increasing volume, some approach to softness and elasticity, especially if the pulse, at the same time, become less frequent, is an almost certain sign of the subsidence of the inflammation. Sickness and diminished urine are unfavourable symptoms; and a moderate flow of urine, with gentle warm perspiration favourable; but a cold clammy sweat is fatal.

When we have reason to believe that the peritonitis is set up by perforation of any hollow viscus and extravasation of its contents, the prognosis is, in the highest degree, unfavourable; yet even here, when the patient has survived more than forty-eight hours, we may reasonably hope that the extravasation is being circumscribed by adhesions.

Peritonitis arising from uterine or ovarian irritation or inflammation, (provided it be not of a specific character, as in puerperal peritonitis,) is generally amenable to judicious treatment, though it may be fatal, as in the case already related. The peritonitis of blood diseases is dangerous pretty much in the proportion of those diseases themselves: that of gout or rheumatism being rare, though not without great danger when it does occur; that arising from uræmia, as in Bright's disease, is not often the cause of death; indeed it is rare to find the peritoneum alone implicated, and this inflammation, when it does occur, which happens in a very great number of cases, though of an acute is not often of a very active character, the effusion being mainly serous; it is to be regarded as a consequence of a very dangerous disease, and also as adding, in no inconsiderable degree, to the danger, rather than as, upon its own account, very formidable.

Of the scarlatinous peritonitis not much is at present known, but as far as we do know, there is reason to believe it to be highly dangerous, often speedily fatal, if not at all times necessarily so; and the same may perhaps be said of the erysipelatous peritonitis.

The treatment of acute peritonitis, like its diagnosis and prognosis, must be guided by our estimate of the powers of the patient and our knowledge of its cause. When we can detect no primary lesion, or, in other words, when we believe the cause to be one of simple primary peritonitis, the first object of our treatment must be to reduce the inflammatory action, the second to keep at rest as much as possible the inflamed part, and the third to induce a moderate mercurial action. Where there is no such depression of the pulse as to lead to the apprehension of immediate sinking, blood may be drawn from the arm; and if the operation be followed by any increase in the volume of the pulse it may be safely repeated in a few hours. If by these measures we have in any degree diminished the hardness of the pulse, it will be more prudent not to repeat the venesection, but to apply from ten to twenty leeches over the surface of the abdomen. The next indication, though apparently of almost a negative character, is of the utmost importance, namely, to obviate all disturbing causes which might irritate the inflamed part. For fulfilling this indication one obvious method is to abstain from the use of purgatives, and there can be no more mischievous practice than the exhibition of such drugs in acute peritonitis; the chief reliance should be upon opium, which may be given in grain doses, repeated at intervals of about four hours. There need be no apprehension of the opium confining the bowels, as it is by no means desirable that they should act as long as active peritonitis exists; and when the inflammation has in some measure subsided, the probability is that the opium will act as an aperient. It is also worthy of remark that the opium will to some extent counteract the tendency to exhaustion produced by the bleeding, and that the bleeding will render the patient more tolerant of the opium. With the opium mercury may be combined, but never in such doses as to effect the bowels. As a general rule a grain of calomel may be given with each grain of opium, or if there be reason to apprehend irritability of the bowels, two grains of hydrarg. cum cret. may be used instead. It is also important to keep the patient in the recumbent position, and he should not be allowed to get out of bed, or even to sit up for any purpose whatever. When the pain and tenderness are manifestly diminished, a blister may be applied; but this is only admissible after the more acute symptoms have subsided, not only upon the general principles already laid down, but because the superficial tenderness caused by the blister may interfere with our examination of the abdomen, and may mislead us as to the real seat of the pain. Upon the same principle that we avoid disturbing the intestines by purgatives, we should endeavour to keep the stomach as tranquil as possible; we should therefore forbid large draughts of anything, and endeavour to support the patient by giving from time to time about two tablespoonfuls of barley-water, or, what is perhaps to be preferred, especially if there be any tendency to sickness, about the same quantity of milk and lime-water in equal parts. When there is sickness it will often be counteracted by the opium or calomel; but should this not succeed, about ten grains of calcined magnesia (Henry's is the best) with five minims of vinum opii in an ounce of water, may be given every four hours. The practice of administering effervescing draughts, and thereby suddenly distending the stomach by the rapid evolution of gas, is at best inconsistent. Sinapisms may also be applied under such circumstances to the scrobiculus cordis.

The treatment of peritonitis from perforation of the stomach, or of any other portion of the alimentary canal, is almost hopeless; yet as inspections after death show us that the consequent extravasation may be circumscribed by adhesions, and the fatal extension of the disease thus prevented, we must endeavour by all means to favour such a process. The great principle of treatment, then, in such a case, is rest. The patient should not only be kept quiet, but as far as possible motionless. Small quantities of bland fluid, not exceeding half an ounce at a time, should be given as nutriment (the milk and lime-water, for instance), and the opium administered, one good effect of which will be that we shall be better able to maintain the quiet which is so indispensable. By acting upon these principles, a case of perforation of the stomach was actually saved under the care of, Dr. Hughes, and Mr. Ray of Dulwich, though the patient subsequently died of a similar disease.

The peritonitic symptoms which not uncommonly follow parturition, independently of the specific form of the disease constituting puerperal peritonitis, will generally yield to strict observance of rest, the application of about twelve leeches, followed by warm fomentations, or the application of a warm linseed poultice, care being taken that the leech-bites do not continue to bleed too long after the application of the latter.

As the peritonitis consequent upon ovarian irritation or inflammation may occur in every variety of intensity, it will require a corresponding variety of treatment. As it will in many cases be next to impossible to distinguish with certainty between neuralgic and inflammatory pains, a middle course must often be adopted. For this purpose rest and an unstimulating diet should be enjoined, and a pill of one of the accompanying forms administered about three times daily. (F. 59.)* When menstruation is impending, the latter is to be preferred, the drops (F. 61)† being given in the intervals. In more severe and decided cases, where the tenderness is great, the pulse sharp, and the bowels confined, the treatment must be the same as in simple peritonitis, care being taken, however, not to carry depletion so far, the use of the lancet being rarely admissible. The caution about purgatives is also as applicable here as in other cases: when the inflammation has subsided the bowels will generally act spontaneously.

The treatment of peritonitis arising from uræmia belongs perhaps mainly to that of the disease which gives rise to it:

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* (59) ℞ Ext. Hyoscyam. gr. x.
Hydr. cum Cret. gr. iv. Misce.
Fnt. Pil. iij. Sumat. i. ter die.

Or, ℞ Ext. Conii, gr. x.
Hydr. cum Cret. gr. iv.
Fnt. Pil. iij. Sumat. i. ter die.

† (60) ℞ Liq. Potassæ, ʒ ii.
Sp. Æth. nit.
Tinct. Lupuli āā ʒ iii. Misce.
Sumat cochl. j. min. ex. Decoct. Hordei, ℥ j. ter die.

that arising in Bright's disease being generally of subacute character, depletion will rarely be required. Mercury, as is well known, is a most dangerous remedy in Bright's disease, and should therefore be rarely used. When administered it should be withdrawn upon the slightest indication of its specific effects, which must be most carefully looked for. Saline diaphoretics, as the liquor ammoniæ acet. or the citrate of potass (F. 61)* are often beneficial; and if there be no sickness, antimony is the remedy upon which we may place the most reliance. This may be given either in the form of the antimonial opiate pill (F. 26) or of three grains of James's powder with the same quantity of hyoscyamus three times a day; the opium, however, must not be administered if the pupil be contracted, or if there be any of the symptoms of cerebral affection, so common in uræmia. When these latter symptoms are absent, the pulv. ipecac. co. in doses of three or four grains, three times a day, will often be of service. In the peritonitis which sometimes occurs almost contemporaneously with the invasion of scarlatina, which is to be known in most cases only by its fatal result, we can of course do but little, the chief indications being for the use of stimulants. When, however, as is sometimes the case with the peritoneum as well as with other serous membranes, it becomes inflamed towards the subsidence of the fever, independently of uræmia (the signs of which should, however, always be carefully looked for), it must be treated upon the ordinary principles, though we must not forget that the patient has passed through a depressing disease, the poison of which is scarcely eliminated from the system; depletion must, therefore, never be attempted, unless the pulse have considerable volume and firmness as well as sharpness, and the tenderness be intense. Calomel, with Dover's powder, or the antimony and opium and saline diaphoretics, must therefore constitute the staple of the treatment, the effect of the opium upon the brain being carefully watched. The same rules of treatment apply to the erysipelatous peritonitis.

The treatment of puerperal peritonitis belongs more appropriately to the obstetrician; but it is the duty also of the general physician to be aware of the principles upon which this treatment is to be conducted. The inflammation may be stated to be the effect of the localization in the peritoneum of the influence of a specific morbid poison, in which respect it may be said to resemble the inflammations which arise in pyæmic poisoning. There is, however, a greater tolerance of bleeding than in the latter disease, and in some epidemics this measure is well borne ; but as a general rule it must be resorted to with much caution; and in estimating its expediency, we must be guided as well by the general epidemic character of disease,—that is to say, not only by the tolerance of depletion evinced by other patients suffering from the same disease, but by the greater or less tolerance of similar measures evinced in all diseases which may happen to be prevailing at the time—as by the particular condition of each individual patient. When, for instance, fevers with a tendency to prostration, especially exanthems, such as scarlatina or erysipelas, quickly assuming a typhoid character, are prevailing, the lancet should be almost entirely laid aside, and even leeches used with the greatest caution. As regards the indication to be drawn from the patient herself, we must look mainly to the pulse : if in the onset of the disease the pulse is hard without being very small, that is to say, if the heart evince some power, and at the same time the inflammatory contractility of the pulse is well marked, blood may be drawn if there are none of the contra-indications *from without* which have just been alluded to. Next, if next, to bleeding in the efficiency, and far beyond it in extent of applicability, is opium, which appears not only to fulfil the indication of restraining the peristaltic action of the intestines, but also appears to have a direct effect upon the disease. In this, as in other forms of peritonitis, or perhaps even more so, purgatives should be carefully avoided: it has happened that the withdrawal of the opium, and administration of an aperient, have brought back the worst symptoms of the disease, when they had to all appearance subsided.

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* (61) ℞ Pot. Bicarb. ℈ i.
Acidi Citrici, gr. xv.
Sp. Æth. nit. ʒ ss.
Syrupi Aurant. ℥ ss.
Aq. destillat. ʒ x. Misce.
Ft. Haust. ter die sumend.

Of chronic peritonitis Dr. Abercrombie truly observed, that this insidious affection is more common than persons not familiar with pathological investigations are generally aware of. It is a disease of the utmost danger, yet often extremely obscure in its symptoms, and can only be treated with any prospect of success by the greatest attention to its very earliest indications.

This chronic, or more properly speaking subacute, inflammation of the peritoneum, may arise from a variety of causes : thus, in many cases, it is the effect of previous acute peritonitis, where there has been organization of lymph of different degrees of plasticity, accompanied by serum, which generally does not become absorbed ; in which case we have serum and puriform matter, with, here and there, lymph agglutinating the contents of the peritoneal cavity.

Another form of the disease, and that which includes, perhaps, the greatest number of instances, is associated with tubercle; and is the local affection by which the tuberculous diathesis most frequently manifests itself in more advanced childhood and early youth. The liability to the deposition of tubercles in the abdomen, and especially in the peritoneum, may be said, as regards age, to follow the tendency to such deposits in the encephalon, and to precede that in the chest. In such cases, the disease consists in the deposition of various forms of tuberculous matter on the surface of the peritoneum; in some instances there may be only the minute transparent miliary tubercle; in others, again, there may be associated with these, the flattened opaque white tubercle, lying apparently immediately under the surface of the membrane, without any inflammatory deposit upon it; in others again, and those especially in which the cause of death is to be referred to the peritoneal disease, there is every variety of tuberculous and inflammatory deposits, agglutinating and knotting together in some parts the intestines into such an inextricable mass, that it is often almost impossible to unravel them.

In another form of the disease, to which the term chronic is perhaps more particularly applicable, there is thickening, contraction, and opacity of the membrane, with little or no deposition of lymph, but a large effusion of serum, constituting one form of ascites.

The symptoms of chronic peritonitis are, as has just been observed, in a great number of cases very obscure, it being often next to impossible to assign with any exactness the period of its first invasion. At first there is commonly more or less pain, which is either constant or occurring in paroxysms: this pain is in some cases referred to a particular part, at others it extends over the whole of the abdomen; there is generally increase of the pain upon pressure, and also upon motion, or upon assuming the erect position, or there may be no pain, but merely a dread of pressure. The abdomen is generally rather tumid, and upon the whole resonant upon percussion, though there may be here and there points of dulness; at times also what appears to be a solid mass may be detected in the abdomen by percussion and manipulation. In some cases, and these more advanced, the abdomen is flat, and the resonance defective: the abdominal muscles, especially the recti, are often strongly contracted, and give a feeling to the hand as of a nodulated mass beneath. In most instances there is vomiting at times during the course of the disease; sometimes, it may be, from intestinal obstruction, sometimes from intercurrent acute peritonitis in the upper part of the abdomen, and, sometimes, in the tuberculous cases, from disease of the mesenteric glands, or enlargement of the glands in the neighbourhood of the pylorus. The bowels are very irregular in their action, being in many cases irritable, though even where this is the case, they are liable to intervals of obstinate constipation; sometimes the first appearance of the disease dates from an attack of the latter. The action of the bowels is almost always attended with pain.

In addition to these symptoms, which are directly referable to the abdominal disease, we find others which belong more to the state of the system upon which it depends, or to which it has given rise. In those cases which are the sequelæ of acute peritonitis, there will not necessarily be any previous history of tuberculous or other cachexia; yet even here there will probably have been some antecedent disorders which may have given rise to the first peritonitis; since, as we have pointed out, primary or idiopathic peritonitis is an uncommon disease, and therefore in these cases there will probably be elicited, circumstances which would excite the suspicion of some affection of the abdominal viscera, such as would have been likely to excite peritonitis; and in addition there will have been subsequent derangement of the health, with more or less general emaciation. These remarks are perhaps specially applicable in the case of females, in whom the peritonitis has been produced by ovarian or uterine disease.

In the most numerous class of cases, those namely which are of a tuberculous character, the general symptoms will be those of the strumous diathesis, such as have been described in treating of phthisis pulmonalis; indeed, this form of peritonitis, with its frequent accompaniment, strumous affection of the mucous membrane and the mesenteric glands, constitutes a modification of phthisis abdominalis. Instances of this disease generally present themselves in young persons between the ages of ten and twenty; and when in such subjects, we have pain and tenderness in the abdomen, with emaciation, and more especially if there be occasional flushings of heat, with a quick pulse, and tongue furred at the back and centre, with red edges; and if the bowels be irritable, with intervals of constipation, we may generally infer the presence of chronic peritonitis of a tuberculous character.

In the chronic peritonitis to which we have alluded as presenting more the appearance of ascites, there are no very characteristic general symptoms; there will be emaciation, and generally considerable anxiety of countenance; the pulse for the most part quick, the bowels torpid, the urine scanty and often depositing urates.

The progress of chronic peritonitis is liable to great variations; but in the majority of instances, unless it be early arrested, its tendency is to a fatal termination. In such cases, under favourable circumstances and judicious management, the bowels will become regular, and the evacuations healthy, often after the removal of large accumulations of solid matter, when the tenderness may disappear, and, nutrition being restored, the patient regains flesh. But even under these circumstances, there is great liability to relapse, for since the previous accumulations had in all probability taken place through the contractility of portions of the intestine having been impaired by previous disease, there is a liability of its recurrence, and also a danger of fresh obstructions being established by the insidious progress of chronic inflammatory action: such cases require constant watching and the greatest care, for months after the disease has apparently subsided. If, on the other hand, the disease be not arrested, the tumescence and tenderness of the abdomen increase, with extreme pain often referred to particular parts; the action of the bowels becomes more irregular and attended with greater distress; sickness may become urgent; and the patient sink, either exhausted by inability to retain nourishment, or worn out by the continual suffering; or, life may terminate more suddenly from perforation of the intestine consequent upon obstruction.

The progress of that class of cases to describe which the term phthisis abdominalis has been applied, is very similar, as regards the constitutional symptoms, to that of phthisis pulmonalis, but even in these, we sometimes find the disease rather unexpectedly to recede, the abdomen losing its tumescence, the bowels recovering their healthy action, the patient regaining his health and strength: sometimes, too, even when the swelling has continued, and fluctuation has been distinctly felt, and hectic symptoms have been well marked, there has been an escape of pus through the ring of the external oblique muscle, or through the umbilicus, and the patient has eventually recovered. In by far the greater number of instances, however, when the disease has been well marked, emaciation has increased, and the patient has died of exhaustion, unless previously cut off by any of the casualties before mentioned.

In the chronic peritonitis, which has been described as assuming the form of ascites, the fluid is rarely absorbed, and the continued pressure on the abdominal viscera commonly produces death from emaciation and exhaustion; though even here it has sometimes happened that the fluid has disappeared after a copious discharge of water, either by the bowels or the kidneys, in one case, after an abundant flow of saliva.

Since the symptoms of chronic peritonitis are so obscure and insidious, the diagnosis must, especially at the commencement, be difficult; and, although it may be true, as stated by Abercrombie, that when there is continued pain and tenderness in the abdomen, we may generally infer the existence of chronic peritonitis; there are diseases with which it may be confounded, amongst which may be reckoned, tabes mesenterica, worms, infantile remittent fever, and phthisis pulmonalis. As regards the first of these, it rarely happens that chronic peritonitis runs its course without more or less complication of mesenteric disease, and although it may be doubted whether the latter is ever the direct cause of the former, there can be no doubt that peritonitis often supervenes upon it; and for these reasons the diagnosis becomes of less practical importance, though the tenderness of the abdomen would generally enable us to distinguish peritonitis from uncomplicated mesenteric disease. In the case of worms and infantile remittent fever, though there may be pains in the abdomen, they may be readily distinguished from chronic peritonitis, both by the general symptoms and by manipulation of the abdomen. For a diagnosis between this disease and phthisis pulmonalis we must again have recourse to a careful observation of the physical signs, since the constitutional ones are often so nearly identical; and here, too, we may remark, that the two affections are very often coincident: so much is this the case, that in young persons presenting some of the symptoms of chronic peritonitis, we should institute an examination of the chest with a view to ascertain if there be any early signs of phthisis, as this discovery would tend to confirm our diagnosis in regard to the abdominal disease; and the practical question will often be, not whether either of these diseases exist, but which is the more advanced of the two: and it is well to bear in mind, that, though the majority of cases of tuberculous peritonitis occur in young persons under the age of eighteen, many such subjects die *with* phthisis pulmonalis, though not *of* it; whereas, whilst the majority of cases of consumption occur above the age of eighteen or even twenty, many such subjects die *with* the disease which we have termed phthisis abdominalis, but *of* phthisis pulmonalis. Inflammation of the mucous membrane of the intestines when uncomplicated with peritonitis, may be distinguished from the chronic form of that disease by the absence of superficial tenderness, the form of the abdomen, the character of the evacuations, and the defined pink flush on the cheeks.

Besides the general distinctions between chronic peritonitis and the diseases just mentioned, there are other points bearing upon the diagnosis to which our attention ought to be directed. Thus, in examining the abdomen by the hand, what appear to be tumours may not unfrequently be detected; of these it would at first be impossible to say whether they are strumous or other masses, or accumulations in the intestines; and the only mode of ascertaining will be to administer a gentle laxative; as, for instance, three or four grains of grey powder to be followed in a few hours by a dessert-spoonful of castor-oil, and to observe the character of the evacuations and the effect upon the swelling. This may be repeated several times, as long, in fact, as any solid matter continues to be brought away, after which it will often be found that the supposed tumour has disappeared. The removal of such swellings by these means is not, however, conclusive against the existence of chronic peritonitis, since, as has been pointed out, it may be the cause which has rendered the intestines liable to such accumulations.

Besides the general diagnosis of the presence of peritonitis by the signs which have already been detailed, we may often arrive at a greater degree of certainty, not only as to its existence, but also its character, extent, and situation, by careful manipulation, and even auscultation: thus, when exploring the abdomen by the hand and fingers—besides the deviations from its natural elasticity and the points of tenderness complained of by the patient, a certain crepitation is felt, under the fingers, which has been, not unaptly, compared to the moving of greased surfaces one over the other;—this will indicate fresh or unorganized lymph, corresponding to the part where it is felt. Again, the application of the stethoscope will often detect, especially towards the margin of the ribs, a dry friction sound, or a soft crepitating one, not unlike that which has been termed mucous crepitation: the former of these is indicative of old fibrinous effusion, and the latter of recent and soft lymph. These phenomena will sometimes enable us to define the boundaries of the effused lymph with remarkable precision.

The chronic peritonitis which constitutes one form of ascites, and which often presents no symptoms before the occurrence of the effusion, is to be distinguished from ovarian dropsy by the absence of those signs which characterize the encysted form of the latter, though from hepatic dropsy the diagnosis is not so easy; it may, however, be inferred, from the absence of the symptoms and the previous history which belongs to the latter, as well as from the greater hardness and more globular form of the abdomen.

The prognosis of chronic peritonitis is, in the majority of cases, unfavourable, though we are not to conclude that it is at all times necessarily so. When the disease is the result of previous acute peritonitis, there is great danger from the liability to intestinal obstruction, arising either from adhesions, from bands of false membrane pressing upon the intestines, or from the loss of contractility induced by the inflammation. Such cases may, however, under careful management, apparently recover, and the patient escape any serious inconvenience; though the possibility of his having at any time a dangerous attack of intestinal obstruction is not to be lost sight of, especially when a question arises as to the probable value of his life. These remarks apply, though not perhaps with equal force, to the case of females in whom the disease has occurred from uterine or ovarian affection. Of strumous peritonitis, it may be said that the disease is only less dangerous than pulmonary consumption, and it is hard to give any reason why it should be so at all, unless it be that the access of air in the lungs causes a softening of the tuberculated portion of the organ, and consequent destruction of the surrounding tissue, which does not take place in the closed peritoneal sac. The occurrence, too, of symptoms of strumous peritonitis in young persons of phthisical families might be supposed to have an unfavourable bearing upon their prospects as regards their liability to phthisis at a maturer age. Yet, strange as it may appear, cases have occurred in which there have been well-marked signs of early phthisis pulmonalis coexisting with undoubted chronic peritonitis, where the development of the latter disease seemed to exert a revulsive influence in arresting the progress of the former.

This was unmistakably the case in a patient to whom allusion has been already made, who recovered after the escape of a large quantity of puriform matter by the umbilicus, and in whom there were auscultatory signs of incipient, or, to speak more correctly, early phthisis. In the chronic, serous peritonitis, or, peritonitic ascites, the prognosis is also unfavourable, though even here, as has been pointed out, the effusion may sometimes disappear after profuse watery discharges.

The treatment of chronic peritonitis must be conducted with the greatest caution, the object being first to avoid all needless excitement, of the peristaltic action of the intestinal canal, which has the effect of aggravating the inflammatory action where it exists, and exciting it afresh, where it has subsided:—secondly, to check any tendency to acute inflammation which may arise in the progress of the disease;—and thirdly, to correct that condition of the constitution, upon which it so frequently depends. In the subacute disease, which is a sequel of the acute, we must carefully look for any indication of fresh inflammatory action arising in particular parts, and when this is the case, we must, where the powers of the patient admit, apply a few leeches over the affected part. After this blisters may be occasionally used, or a stimulating liniment applied to the abdomen; hot fomentation or warm poultices of linseed meal will often give much relief when the pain is urgent. Our next object should be to reduce the tendency to chronic inflammatory action: this will, perhaps, be best effected, in the class of cases of which we are now speaking, by the moderate and carefully-regulated use of mercurial preparations: these are generally best combined with opium to prevent irritation of the bowels, and there is, perhaps, no better form than one grain to a grain of calomel with three or four of compound soap pill twice or thrice a day, watching at the same time most carefully for the signs of the specific action of the mineral, in which case it should be immediately withdrawn, or, at all events, reduced to one dose in the day; for the continuance of slight mercurial action is, perhaps, desirable in those cases in which emaciation and general exhaustion are not great, and we have good reason to believe that the disease is not of a tuberculous character. When the bowels are sluggish, as they often are in this form of chronic peritonitis, the most gentle laxatives must be used; perhaps there are few better than the hydr. cum cret. and castor oil; but should the bowels be obstinate, we must on no account attempt to force an action by strong purgatives. As a general rule in cases of this kind, those aperients which appear to soften the contents of the bowels, by promoting the secretion from its lining membrane, are to be preferred, whilst those which act more by exciting the action of the muscular coat are to be avoided. When the action of the bowels is torpid and there are occasional pains, the liq. potassæ will be found very serviceable, and to this may be added a little pot. iodid., say two grains to a dose, which will often promote the absorption of effused matter. The occasional use of soap enemata is also to be recommended. As the patient recovers, pure air and gentle exercise are incomparably the best tonics for restoring the tone and contractility of the muscular coats of the intestines, as well as promoting absorption so far as it can be effected.

In those cases in which, from the signs we have here pointed out, there is reason to believe the peritoneal inflammation to be of a strumous character, we must be even more upon our guard to avoid depressing the powers of the patient, and especially cautious in the use of mercurials: when there is any great increase of tenderness, and reason to apprehend the supervention of acute inflammation, a few leeches may be applied to the part, and we may venture upon about a grain of calomel, or two or three of hydrarg. cum cret., with four or five of pulv. ipecac. co. night and morning; and when the pulse is softened, and the skin cooler, a blister may be applied. At the same time with these remedies, we may also administer one of the accompanying mixtures (F. 62 ,* the former to be preferred if the urine be scanty. Should there be no symptoms of intercurrent acute peritonitis, or as soon as they have subsided, the iodide of potassium may be used with advantage, in doses of from a grain and a half to three grains; it will be best given with the first mixture. At this period of the disease we must direct our attention as much to the strumous diathesis of the patient as to the local disease, and therefore diet and general mode of life become of the greatest consequence.

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* (62) ℞ Liq. Potassæ, ʒ iij.
Tinct. Lupuli. ʒ iv.
Sp. Æth. nit. ʒ v.
Sumat cochl. i. min. ex Decoct. Hordei cyatho ter die.

Or, ℞ Sodæ Bicarb. gr. xiv.
Tinct. Hyoscy. ♏ xx.—xxx.
Sp. Æth. nit. ʒ ss.
Mist. Acac. ʒ iv.
Sp. Pimentæ, ʒ ii.
Aq. puræ, q. s. ut fiat mist. ℥ iv.
Sumat part. 3^{tiam} ter die.

In regard to diet, we must remember, that we are probably exposed to disease in the mesenteric glands and the lymphatics, and that the stomach and bowels are prone to be either irritable or torpid in their action. At the same time we must endeavour to convey into the system the greatest amount of nutritious non-stimulating aliment that it is capable of receiving and assimilating.

In promoting the recovery after the severer symptoms have subsided, or preventing their invasion, where there is reason to apprehend them, the importance of pure air and light are not, perhaps, sufficiently estimated. Children in whom there exists any indications of a strumous diathesis should, at all times, be kept in as pure an air as circumstances admit of; and not only should this be carried out by residence in the country in elevated situations, or by the sea-side, but also by their spending a large portion of their time in the open air. A moderately-warm clothing, covering pretty uniformly the whole surface, is essential, not only for the sake of equalizing the circulation, but also as enabling them to spend much time in the open air without risk. Exposure to the direct solar ray, unless the heat be great; or, at all events, the free admission of light, is no inconsiderable preventive against the establishment of strumous disease.

In the chronic serous peritonitis or peritonitic ascites, we may use mercury somewhat more freely, the combination of squill and blue pill being in general the preferable form, or the following pill (F. 63)* may be administered three times daily, saline diuretics being given in the intervals, to which may be added from one to two drachms of infusion of digitalis, provided the effect upon the pulse be carefully watched. Hydragogue cathartics in the form either of pulv. jalap co., of elaterium with bitart. of potass being exhibited from time to time (F. 64).†

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* (63) ℞ Pulv. Digitalis, gr. i.
Pil. Hydrarg. gr. i.
Pulv. Scillæ, gr. i.
Ext. Hyoscy. gr. ij. Misce.
Ft. Pil.

† (64) ℞ Extract. Elater. contriti, gr. ⅛.
Pot. Bitart. gr. xvj.
Zingiberis contriti, gr. ij.
Probe misceantur ut ft. Pulv.

Should the swelling continue, and the urine not be increased after the mouth has been slightly affected by the mercury, iodide of potassium should be tried, which may be administered in the form prescribed above. As, however, these and all measures for promoting the removal of the fluid by absorption will, in many cases, prove unsuccessful, it will often be necessary to have recourse to paracentesis, though the operation is, under such circumstances, not without danger, owing to the peritoneum being already in a state of chronic inflammation; any considerable tenderness, sharpness of pulse, or other inflammatory symptom, should therefore be received as a contra-indication. When the operation is determined upon, it would be well to have recourse again to the mercury, until the mouth is slightly affected, when paracentesis may be performed. When the pulse is feeble, a small trochar should be used for this purpose, the abdomen carefully bandaged, and a grain of opium administered with a grain of calomel. After the patient has recovered from the immediate effect of the operation, diuretics with the iodide of potassium may be resumed.

XX.

ENTERITIS AND OBSTRUCTED BOWEL.

Enteritis is a term, the meaning of which, as used by different authors, it is not very easy to define. Some appear in speaking of it to contemplate inflammation of the mucous membrane, others that of the serous. Dr. Watson, with his accustomed fondness for simplicity, interprets it as inflammation of the bowels, by which he means inflammation of the serous membrane, the muscular and areolar tissues, and the mucous membrane, of a portion of intestine: and this is the sense in which we purpose to apply it.

It is very doubtful if this disease is ever a primary one: most authors speak of the inflammation as arising in the peritoneal coat, and extending from thence to the other tissues of the intestine; but we have seen that primary peritonitis is a very rare occurrence. Still, as enteritis is spoken of as a primary lesion by many authors of reputation, as it is one which we not uncommonly meet with as a consequence of some antecedent disease or irritation, as, above all, it is a disease of the greatest danger, proving fatal if not relieved in a short time, and requiring the most careful discrimination as to its diagnosis and treatment, it is necessary to be well acquainted with its nature and symptoms.

Enteritis may commence with some very well-marked pain, or extraordinary sensation in the abdomen: patients have more than once spoken to the author of the first symptom having been a sense of something having given way or becoming twisted or displaced. In some cases there are rigors. The pain, which is at first circumscribed, rapidly becomes more and more intense, and extends over the whole abdomen. There may not be much tenderness, at the commencement, but in a short time it becomes so severe that the slightest pressure, even that of the bed-clothes, cannot be borne. The pain in enteritis is incessant, though it is subject to paroxysms of aggravated intensity: in this respect it differs from that of colic, in which the pain comes on in paroxysms, and entirely subsides in the intervals. It will sometimes happen that at the very commencement of the attack there will be copious relief of the bowels, after which they become obstinately constipated. Nausea and vomiting supervene sooner or later, though the period at which this happens varies according to the seat of the disease. The vomiting is often highly offensive, having an odour of fæces, and thence called stercoraceous, showing that the matter ejected has been brought up from the lower part of the canal, though most probably not lower than the ileum. The sufferings of the patient are most distressing; he lies on his back, with his knees drawn up to relax the abdominal muscles. The respiration is hurried and mostly thoracic; and the movements and position all evince an apprehension of pressure or disturbance of the inflamed part; so that though there may be jactitation of the extremities, the trunk is kept perfectly quiet. The countenance, as in peritonitis, is expressive of great distress. The symptoms are generally, at the commencement, those of inflammation of a serous membrane, which, from the implication of a mucous surface, from its intensity, and often from its situation, speedily exercises a very depressing influence. Accordingly the pulse may be at first full and hard, but soon losing the former character, whilst it retains its hardness, it becomes wiry, and as the disease advances, thready and almost imperceptible. If the inflammation do not subside, the distress and exhaustion of the patient increase, the pulse becomes smaller and smaller, and at last imperceptible, the skin clammy; and death takes place from failure, or rather depression, of the heart's action. In some instances, the pain suddenly ceases some time before death: this used, as in the case of peritonitis, to be referred to gangrene, but that is not always found to have occurred: it is probably the effect of nervine exhaustion.

The above constitute the *essential* symptoms of enteritis, and may be summed up as consisting of those of intense inflammation in the abdomen, to which are added those of the "*læsa partis functio*," in the form of arrested action of the bowel, and its consequences. There are, however, several which may be termed accidental symptoms, about which a good deal of discrepancy will be found in different authors; the explanation of which is that these are referrible to the cause of the inflammation, and the part of the intestine affected by it, both which may vary.

Now a common, perhaps the most common, cause of enteritis, is mechanical obstruction, of which we shall presently speak more fully; and hence we have shrinking or swelling of the abdomen;—vomiting coming on among the first symptoms, or not till towards the close of the disease;—scanty and high-coloured, or abundant and pure urine, according as the obstruction is seated near the commencement, or the termination, of the canal. All these, then, have been enumerated amongst the symptoms of enteritis. If the occlusion have taken place in a portion of intestine near the yielding parts of the abdominal parietes, there will be generally a local tumescence; but if more deeply seated, there will be no appreciable swelling.

In some instances, though these are not the most frequent, the inflammation appears to have arisen spontaneously, or at least independently of any mechanical cause. Where this has been the case, a portion of the bowel is dark, almost livid, having the peritoneal coat covered with flakes of lymph, and the mucous lining with sanious mucus, the intestine being at this part much dilated, though below it the canal is empty and firmly contracted; this contraction being the effect, and not the cause, of the obstruction above.

In some of these cases we can, as we have said, assign no cause for the inflammation, though in many there can be little doubt that it has been set up in the following manner:—Irritation proceeding from some indigestible matter in the canal;—a strong purgative, to remove the cause of that irritation;—another purgative to overcome the obstinate constipation, which has resulted from the increased irritation induced by the first;—enteritis and its disastrous consequences. It is to this form of enteritis, occurring in the small intestine, that the term *ileus* or *iliac passion*, has been applied. Another class of cases, in which the inflammation commences in the cæcum and appendix vermiformis, are those in which a cherry-stone, a lump of hardened fæces, or even a pill, has been found in the latter, though it is more than probable that there was some pre-existent disease to allow of its intrusion: in these the pain and tenderness commence in the region of the cæcum, where there is also some tumefaction. Closely resembling the above are those cases to be noticed presently, in which peritonitis and enteritis appear to have been set up by disease in the ovary.

The diagnosis of enteritis from colic depends upon—the tenderness; the pain of the latter being relieved by pressure—the persistence of the pain—the sickness—and the signs of acute inflammation. It is of course essential to ascertain that there is no hernia, and all the outlets of the abdomen should be most carefully examined.

The treatment of enteritis rests upon the simple principles of subduing the inflammatory action by such measures as the strength will admit of, and keeping the inflamed part at rest. When the patient is seen early, and the pulse is moderately *full*, as well as *hard*, venesection to the first signs of fainting is admissible; and it will often happen that this will be followed by a spontaneous action of the bowels; leeches may also be applied to the seat of tenderness. Purgatives should on no account be given; but the patient must be put upon the use of calomel and opium in equal parts. The pain often renders the tolerance of opium great, so that eight or ten grains may often be given in the course of twenty-four hours; but the calomel should not be increased to the same extent as opium. The occasional use of a soap enema is admissible. We must not forget the tendency to death by asthenia in this disease; and when the extremities become cold, or the pulse very feeble, wine or brandy should be given. When the action of the mercury begins to show itself on the gums, it should be withdrawn, and the opium steadily persevered with.

OBSTRUCTED BOWEL.

By obstruction of the bowel is meant that degree of constipation which does not yield to the action of ordinary remedies. This obstruction is an affection of such extreme danger, and one the mismanagement of which is so eminently mischievous, that it is here spoken of as one disease. It, however, may arise from causes so various that it is next to impossible to classify them according to any strictly pathological arrangement, although the success of our treatment must depend, in great measure, upon our discrimination in detecting the principal one; and therefore, before proceeding to describe the disease, we shall enumerate them.

These causes may be either inflammatory, as in the case of peritonitis or of enteritis; or the obstruction may be a more remote effect of inflammation, as in the case—of the impeded peristaltic movement, from adhesion of one portion of bowel to another, or to some neighbouring viscus,—of constriction by a band of false membrane, or—of the diminished contractility of the muscular coat, which ensues upon and may continue after peritonitis or enteritis. It may also be produced by chronic disease, whether inflammatory or otherwise, causing contraction or thickening of the coats of the intestines;—or it may arise as a consequence of any of the above, the delay in the passage of the contents setting up a distension behind it; and this distension, of a coil of intestine for instance, may cause its displacement (as by rolling over), and a consequent twisting of the bowel. The same thing may be produced, in the large intestines, and this, more especially, about the sigmoid flexure, by habitual costiveness (induced in many instances by neglecting the calls of nature), the distended portion of the bowel having been ascertained in one instance to have rolled over twice.

Analogous to these cases of twisting and strangulation, are those with which the surgeon is familiar, as arising from hernia, which should always be carefully searched for; but hernia may exist without being apparent externally, as in the case of that at the obturator foramen, or that of a loop of intestine passing through some adventitious ring formed by false membrane, or of obstruction at the neck of a hernial sac which has returned within the abdomen.

Inflammatory action in the inner or mucous coat of the intestinal canal does not commonly produce obstruction, though it is to be remembered that dysentery causes a delay in the passage of fæcal matter; and ulceration of the stomach, or duodenum, often produces considerable constipation. Ulceration of the bowel may also cause delay in the passage of its contents, in order, seemingly, to allow time for the process of reparation. Obstruction again may also arise from the accumulation of hardened fæces, generally in the colon, as a consequence of diminished contractility, either from inflammation or over-distension; and hardened fæces, or a foreign body, in the appendix vermiformis cæci, produce constipation of peculiar obstinacy and urgency of symptoms. Another cause of obstruction may be intussusception, or the passing of a portion of intestine into that immediately below it, and its becoming invaginated therein.

Besides these causes we may have others arising from a loss of natural irritability, or an insensibility to the natural stimulus, as in the effect of lesion of innervation; analogous to retention of urine from paralysis of the bladder.

These cases commonly present themselves under somewhat of the following circumstances: the patient, who may previously have enjoyed good health, has felt some sudden pain, sometimes as of a sense of falling or twisting in the abdomen, which in some instances is followed immediately by faintness or sickness, or both; in others there may be for a short time no further unpleasant symptoms. The bowels not acting, however, the patient often of his own accord takes a purgative, which he may even be induced to repeat. Either these medicines are rejected, or the patient suffers much from weight and distension of the abdomen: in this condition, and becoming anxious at getting no relief of the bowels, he seeks for medical advice. Again, in some cases there may have been previous tenderness in the abdomen, with irregular action of the bowels, before the supervention of these symptoms. In others, again, we may elicit a history of some former peritonitic attack; or again, there may have been no well-defined symptoms, but simply a cessation of the action of the bowels, and subsequent weight and distension; or the distressing sensations may have come on speedily after partaking of some indigestible food. Such is the general history of obstructed bowel; yet upon close inquiry we shall find very different and even opposite symptoms in different cases.

Our first business in cases of this kind is carefully to explore the abdomen, in order to ascertain if any external hernia exists. If this examination, which ought *always* to be most carefully conducted, reveals nothing of the kind, we proceed to ascertain, as far as possible, the seat and character of the obstruction, by examination of the degree of tenderness of the abdomen or of any part of it considered in connection with the character of the pulse, the position of the patient, and the degree of pain caused by motion. Should a rather sharp and hard pulse, with considerable pain, aggravated by pressure or motion, induce us to believe that there is some peritoneal inflammation, we must not infer that such inflammation is the primary cause of the obstruction, as the very existence of the obstruction may of itself give rise to inflammation, especially if active purgatives have been used. If, however, there be no sign of inflammatory action, we may conclude that the obstruction is caused either by accumulation in the bowel, by loss of contractile power, as in colic, or by twisting, intussusception, or constriction by some bridle of false membrane. Our next examination should be as to the degree of tumescence of the abdomen, for in this respect we observe two opposite conditions; in the extreme case, for instance, of obstruction in the duodenum, the abdomen is flat or even sunken; in the opposite one, of obstruction at the sigmoid flexure, we have a very tumid and resonant abdomen; intermediate obstructions will give intermediate degrees of fulness. In cases of obstructed bowel, too, there are generally active intestinal movements, which may be distinctly felt by the patient, and are often perceptible to the hand of the observer; they, however, are generally most distinct in those cases in which the obstruction is near or below the ileo-cæcal valve. In such cases, too, fluctuation may not rarely be detected. Sickness, again, is a very important symptom. When the obstruction is high up in the canal, sickness will be early and incessant; when it is in the colon there will be none, except what may be excited by irritating medicines, till the obstruction has lasted some days. In obstruction in the course of the lower part of the jejunum or ileum, we have early sickness, but not so immediate or so urgent as in the case of the duodenum. The condition of the urine is most important as regards the diagnosis of the seat of the obstruction; when the stoppage is high up, as in the duodenum, the quantity of urine is so small, or rather the suppression so complete, that cases of this kind have been mistaken, and that too by men of experience, for ischuria renalis; whereas, when it has been very low down, as in the sigmoid flexure for instance, the urine is abundant and clear. In the first case the suppression of the urine may in a great measure be accounted for by the sickness; it may be observed, however, that sickness, independent of mechanical occlusion near the stomach, as ordinarily observed, never suppresses the secretion so completely. In the case of obstruction in the descending colon, as there is no sickness, and as there is delay in the passage of its contents along the intestinal tube, there is abundant opportunity for absorption; and therefore, from the large quantity of fluid taken up by the veins, the quantity which passes out becomes large.

We take this opportunity of repeating the opinion just expressed of the diagnostic value of the quantity of urine excreted, in aiding us to determine the seat of the obstruction, further observation since the publication of the former edition of this work having tended materially to confirm this belief; and we are compelled to make this assertion from the fact, that though this view has been adopted by several of the highest authorities, it has been called in question by others entitled to great deference, though in a manner which proves that the authors cannot themselves have investigated the ground upon which it rests.

In the 'Guy's Hospital Reports' for 1844 (Second Series, vol. ii., p. 370, *et seq.*), cases are recorded in which the seat and character of the lesion causing the obstruction were ascertained by inspection after death; and in these it appeared that the diminution in the quantity of urine was proportionate to the distance of the obstruction from the pylorus. In one case which fell under the author's own observation, and which is there recorded, there was a total suppression for several days; no urine was passed for five days at least, and then, when a catheter was passed, half an ounce was drawn off; and after death, which occurred about thirty-six hours after the passing of the instrument, the bladder was found perfectly empty, the obstruction being in the duodenum. In the other, the obstruction was in the same situation, and the total suppression of urine was of such duration as to occasion much astonishment in the mind of Dr. Hughes, under whose care the case occurred; though from this case not having occurred amongst his own patients, the author is not able to state exactly the number of days, up to the time of death, during which it lasted. In neither of these cases was there inflammation of the peritoneum. In another case alluded to in the same communication, there was so great a suppression as to give rise in the minds of the eminent provincial physicians of the existence of iscuria renalis, the case being one of mechanical obstruction of the intestine near the pylorus. We cannot, therefore, accept the explanation given by Dr. Brinton in his very interesting Croonian Lectures upon Intestinal Obstruction, viz., "That the violence of the general fever, or of the local inflammation, the pain of micturition, when the bladder is involved in the peritonitis, and (I would almost add) mere collapse can all, by turns or in combination, greatly diminish the quantity of urine passed during intestinal obstruction." Now, as regards the first, granting that general fever or local inflammation will *suppress* the urine for five days, which we confess never to have seen, there were in the above cases neither one nor the other, but simple collapse. Again, as for "the pain of micturition when the bladder is involved in the peritonitis," this could not have occasioned retention, since there was no urine either to retain or to micturate, and, moreover, there was no peritonitis; there remains, then, the collapse, about the existence of which we are agreed; but can it be proved that collapse, as such, produces suppression of urine? It is true, indeed, that in the collapse of cholera there is suppression of urine; but that suppression does not follow the collapse as its consequence, but rather precedes it; and though we would not argue from hence that the collapse is the effect of the suppression, which at first sight might seem a tenable proposition, we are justified in maintaining that it cannot be its cause; the truth, according to the most extensive induction which we can establish, being this: that neither of these is the effect of the other, but that both are the effects of a common cause, namely, the deficiency of fluid in the circulation. This defect arises, in the case of cholera, from the rapid elimination of water from the circulating fluid, in the case of obstruction near the pylorus from the absence of absorption into it. Beyond this, however, we have no evidence that collapse, as such, induces suppression of the secretions, particularly of the urine; since in syncope, and in the collapse which follows an epileptic convulsion, there are generally profuse secretion and excretion of urine.

There is another circumstance which deserves investigation when we would ascertain the character or seat of the obstruction, and that is, the degree of contraction of the lower bowel as carefully explored by a bougie, or the œsophagus tube. When sudden obstruction takes place in any part of the alimentary canal, it generally happens that the whole of the bowel below this part speedily and even forcibly empties itself; and this perhaps applies more particularly to the small intestines, where obstructions, when they do occur, are generally from twisting, intussusception, or acute inflammation. This not only produces the flatness of the abdomen above alluded to, but even a forcible contraction of the rectum, such as in one instance to have induced a doubt of the diagnosis of obstruction high up in the small intestines, from the fact that it was almost impossible to introduce the tube or even the finger into the rectum; so forcibly did the bowel contract through its whole course below the closure. And the same thing occurs in sudden occlusion, or sudden stoppage from inflammatory affection, in the large intestines: thus, in those unfortunate cases in which this mischief ensues from the presence of a foreign body in the appendix cæci, the whole of the large intestines completely empty themselves, and afterwards no action takes place. When, however, the stoppage takes place from chronic thickening or contraction, or from malignant disease,—lesions which are more likely to occur in the large intestines—the bowel often loses its contractility below as well as above the seat of obstruction; and, therefore, the rectum upon examination by the finger may be found dilated; so that the œsophagus-tube when introduced will often coil upon itself in the pouched bowel, which may lead to a belief that it has passed a considerable distance up the canal. This condition rather favours the supposition that the obstruction is produced by chronic or malignant disease, seated probably in the large intestine. The examination of the bowel with a bougie is not without danger; since the instrument passing readily through the dilated portion, may be brought too forcibly in contact with the side of the bowel, just at the seat of the obstruction, near to which there is not uncommonly ulceration. Examination of the lumbar region is also important in determining the seat of obstruction: when it is in the small intestines, the cæcum, or even the ascending colon, there will be no great fulness in the right loin—but if it be in the transverse or descending colon, we generally find a bulging in that region, which when the obstruction is remote, (as in the descending colon or sigmoid flexure,) will generally be very resonant on percussion, from the accumulation of flatus; but if the stoppage be nearer, as in the transverse colon, it may be dull from the accumulation of fæcal matter. If upon similar examination the left loin also be found bulging, the obstruction is in the sigmoid flexure; and if there be also great resonance, it is probably at its termination in the rectum. It may not be amiss to observe that the sigmoid flexure may, under these circumstances, rise up above the crest of the ileum, and produce tumescence, with resonance, in the left lumbar region, which may cause it to be mistaken for the descending colon; a circumstance of no great practical importance as regards the diagnosis, but which deserves grave consideration when any operation is proposed to be performed in that region, with a view to relieving the obstruction.

The prognosis of obstruction of this kind must of necessity depend upon its cause, and it has generally been assumed that where the disease has been of such a nature that it would not yield to active purgatives, it was necessarily of a fatal character. The experience of the last ten years has done much to correct this opinion; and though we must still view every such case with great apprehension, we are not warranted in pronouncing it necessarily fatal. In reference, however, to this view of the subject, the fact of much purgative medicine being in the intestines is not to be overlooked in forming our prognosis, and constitutes an unfavourable element.

A variety of symptoms have been laid down by various authors as warranting an unfavourable prognosis. Amongst these we find nausea, vomiting, pain, tenderness and tumefaction of the abdomen, and high-coloured urine; and these are not without importance, though they never occur together, and, indeed, may be said to be incompatible with each other; and experience has shown us that as many as can coexist may do so, and yet the patient recover. They show, however, either that the disease is high up in the alimentary canal, in which case it is, if not soon relieved, more speedily fatal; or that it is in the large intestines, and the nature of the occlusion such that the distension and obstruction have been propagated high up the canal. The correct view of the matter in the present state of our information is, that all such cases are dangerous; but unless we are certain as to the cause, which we, never can be, unless, there be external hernia, or stricture can be detected by examination *per anum*, they are not hopeless. It is by no means certain that intussusception is necessarily fatal unless aggravated by stimulating purgatives; and in the apparently no less desperate case of a foreign body in the appendix vermiformis, we have yet to learn that recovery, or relief, is impossible under appropriate treatment; more especially as we know that such bodies sometimes are expelled by ulceration through the walls of the abdomen. It may, however, be remembered, as regards the prognosis of intestinal obstruction: that obstruction in the small intestines is fatal *more speedily* than that lower down, and that the same remark applies to those depending upon inflammatory affections as compared with those resulting from chronic thickening; but that these latter, unless in a situation to be relieved by operation for artificial anus, are of all obstructions the most certainly fatal, not excepting even internal hernia.

It is now generally admitted by all rational practitioners, that, after *moderate* aperients have failed, it is advisable to adopt gentler measures and to rely chiefly on enemata, and not, in the words of Dr. Copland, "to prescribe medicines which will irritate and invert the action* of the upper part of the tube without ever reaching the seat of the obstruction." But it has not been sufficiently considered that they may produce serious mischief, even when they do *not* invert the action of the tube, and when they *do* reach the seat of the obstruction; for it must be evident that in cases of mechanical obstruction purgatives must produce much irritation immediately above it, and increase the already existing evil of ulceration. In those cases too in which the constipation is the effect of a conservative arrest on the part of nature of the peristaltic action of the intestines, the action of a strong purgative destroys the only chance of escape for the patient. A remarkable instance of this kind used to be related by the late Mr. Bransby Cooper. The patient, who had resided much in a hot climate, had previously suffered from attacks of constipation, which Mr. Cooper inferred, from his account, to have arisen in the manner just alluded to, in order to allow the closure by means of adhesion to a neighbouring viscus, or to the abdominal walls, of a perforating ulcer of the colon. A powerful purgative was however administered, contrary to the advice of Mr. Cooper, and produced fatal extravasation into the peritoneum. Seeing then that in cases of obstinate constipation no reliance can be placed on strong purgatives, especially when administered by the mouth, and that much mischief may arise from the incautious use of such medicines, the question remains, what is the best course to be pursued?

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* We must here take exception to the term "invert," as we believe that, as shown by Dr. Brinton, increased peristaltic action propelling the contents of the canal against an unyielding obstruction would be sufficient to produce regurgitation, without any inversion.

Supposing, for instance, that from the early severity of the symptoms, from, the sharp and wiry pulse, the urgent vomiting, and scanty urine, we have reason to believe that the cause is inflammation, affecting the serous or muscular coat of the intestines, or both—and that probably high up in the intestinal tube,—the principle upon which we must act, is the subduing the inflammatory action by general antiphlogistic measures, as far as they are admissible. Thus, for instance, when the pulse is firm and the heart's action not depressed, a full bleeding will be of great assistance, and not infrequently speedily followed by an action of the bowels; and upon the same principle local depletion may also be used with caution. The next, and perhaps more important principle, is to favour the subsidence of the inflammation by quieting as much as possible the inflamed or irritated part. For this purpose our chief reliance is upon opium. With the opium calomel may be combined; but increased experience tends to show that this latter remedy, so far from being the more important, must be used with great care; the calomel, indeed, has the advantage of softening the contents of the alimentary canal, and thereby facilitating their passage, and it sometimes happens that a free action of the bowels takes place just as the effect of the mercury begins to show itself upon the system; but the mineral should be withdrawn upon the first signs of ptyalism, when, if there have been no effect upon the bowels, the opium should be continued. The best rule by which to be guided under such circumstances is the pain. These cases are almost always attended with pain, and consequently require a considerable dose of opium to procure sleep; therefore when the patient sleeps we may infer that he is sufficiently under its influence, and he should not be aroused to take it. In the intervals, however, the opium may be given in doses varying from one to two grains every three or four hours. A very convenient form for its administration is the pil. sap. co. of the Pharmacopœia; and when it is thought desirable to use larger doses than one grain of opium, an additional quantity may be added to the pill, *e. g.* (F. 65).* This plan may be sometimes pursued for several days before any decided effect is produced; but at the end of that time free evacuations will often ensue. so much so that the patient may be heard to complain that the pills are "too powerful."

When from the less urgency of the symptoms, from the free secretion of urine, and the gradually-increasing size of the abdomen, we have reason to believe that the obstruction is in the lower part of the canal, and that it is probably of a mechanical rather than an inflammatory character, we must, as in all cases, first make the *most careful* examination, lest by any means the existence of hernia should be overlooked; and having done this we may proceed to explore the bowel most carefully.

If we cannot by the bougie or œsophagus-tube reach the seat of the stricture, we must continue the opiate, and wash out the bowel from time to time with the stomach-pump; but if these means fail, or if there be evidence of stricture in the rectum. the question arises as to whether an operation should be performed. That it has succeeded is true, but it has more often failed. Improved diagnosis and great surgical skill may increase the number of the successful cases; but in the meantime, we must, as Heberden said in his day of the operation for strangulated hernia, "have a dread of directing such a hazardous operation too soon, or such a painful one too late."

* (65) ℞ Pil. Saponis co. gr. xvj.
Opii, gr. ij—iv. Misce.
Fiant. Pil. iv.

XXI.

MUCO-ENTERITIS, TABES MESENTERICA, DIARRHŒA AND DYSENTERY.

LIKE the mucous membrane of the stomach, that of the small intestines is liable to inflammation, both acute and chronic. To this disease we apply the term muco-enteritis, though some authors appear to have spoken of it under that of enteritis.

This affection commences with a deep-seated pain, generally about the right iliac region, which, by degrees, spreads itself towards the umbilicus, and over the whole of the abdomen. This pain is in most cases increased by moderately firm pressure, though there is nothing like the excessive tenderness of acute peritonitis. The bowels are often at the first constipated, but they shortly become relaxed, and sometimes they are so from the first: the evacuations consisting of thin mucus, or serous matter, variously tinged with bile or fæcal matter, and highly offensive. The action of the bowels is generally preceded and attended by much griping pain, and a considerable evolution of offensive flatus; there are also frequent aggravations of pain from the passage of irritating gaseous or other matter through the inflamed portion of the intestine. The constitutional symptoms are not ordinarily of a very severe character; there may be no well-marked symptoms of the invasion of pyrexia, though in many cases there are chills alternating with flushings of heat. The skin is commonly warm rather than hot, though the extremities are apt to be cold; it is also uncertain as to moisture, but in most cases moist and dry, by turns. The countenance is commonly pale, though there is often at intervals a circumscribed flush on one or both cheeks. The pupils are apt to be rather dilated. The pulse is generally accelerated, rather sharp but compressible; the tongue coated with a whitish fur towards the centre, the tip and edges red, with elongated papillæ. The urine is scanty and high-coloured, sometimes turbid with urates. There is considerable thirst.

In the majority of cases, the symptoms gradually subside after a few days. The thirst abates, the pain and tenderness become less, the diarrhœa ceases, and the evacuations resume their natural consistence. In some instances, on the other hand, generally occurring in subjects of feeble or strumous constitutions, the purging increases and becomes incessant, there is sickness, emaciation, extreme prostration, rapid flickering pulse, glazed tongue, and death from asthenia. These latter cases, however, are almost always complicated with disease of the mesenteric glands, and often with strumous peritonitis, constituting the *tabes mesenterica* to be presently noticed. In some instances, too, the inflammation extends to the muscular and peritoneal coats, and assumes the form of enteritis. Perforation from ulceration may ensue, and fatal peritonitis be the result.

The anatomical change connected with muco-enteritis is active congestion of the mucous membrane, showing itself in finely-arborescent injection of the vessels, most intense in the valvulæ conniventes, where there are here and there superficial ulcerations. There is also, as in bronchitis, inflammatory turgescence of the submucous areolar tissue, and in very severe cases, flakes of albuminous matter. The causes of muco-enteritis are—checked perspiration, irritating matters taken into the canal, as indigestible articles of food, shell-fish, stale vegetables, unripe fruits, or drastic purgatives, &c., and very cold drinks taken when the body is overheated. It sometimes is as a consequence of continued fever, and it frequently follows severe burns or scalds, and the retrocession of chronic diseases of the skin.

Muco-enteritis may be distinguished from peritonitis by the absence of extreme tenderness, by the softer pulse and the looseness of the bowels, and, by nearly the same symptoms, from enteritis. From continued fever, of which it is a frequent complication, it may be distinguished by the absence of the oppression and other symptoms of that disease. From dysentery by the pain and tenderness not being limited to the course of the colon, by the absence of the tenesmus, and of the viscid slimy stools.

The treatment of uncomplicated muco-enteritis should be exceedingly simple. When there is much tenderness a light linseed-poultice may be applied to the abdomen, and if the bowels have not been satisfactorily opened, about four grains of hydr. cum cret. may be given, and followed in about four hours by two or three drachms of castor-oil, with as many minims of tincture of opium. Subsequently the carbonate of soda (F. 66,[*]

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[*] (66) ℞ Sodæ Bicarb. ℈ ij.
Mist. Acac. ʒ iv.
Syrupi Aurant. ʒ ij.
Aq. Menth. pip. q. s.
Ft. Mist. ℥ iv. de quâ sumat part. 3tiam ter die.

may be administered, and, if the bowels are irritable, four or five grains of pulv. ipecac. co. every night. If the skin be dry, and opium seem inadmissible, a few minims of vin. ipecac. added to the mixture, will encourage perspiration.

The important part of the treatment consists, however, in removal of all cause of irritation by the blandest diet. This should consist for some time of soft farinaceous food.

Under the above plan of treatment, the acute muco-enteritis will commonly subside, unless the accidents of ulceration or of the supervention of enteritis occur. It may however, especially in delicate constitutions, pass on to the chronic form of the disease.

Chronic muco-enteritis, besides being a sequel of the acute disease, may creep on in an insidious manner, often commencing with the symptoms of chronic gastritis, to which are gradually added, those of muco-enteritis, in a less active though more protracted form. But though the symptoms may be less severe, the disease is more dangerous, the patient's strength gradually failing, and death ultimately taking place, it may be after a period of months or even years, often under an apparent aggravation of his symptoms, though sometimes from the inability of the system to resist an attack of some ordinary malady.

The anatomical changes produced by chronic muco-enteritis are, injection of the vessels of the mucous membrane of the intestines—ulceration, especially about the valvulæ conniventes —thickening and induration of the submucous areolar tissue— and sometimes, as a consequence, contraction of the calibre of the intestine. They are essentially those of inflammation of a mucous membrane, and it is remarkable that they are in the main confined to that membrane; the mucous glands not being, as in the case of continued fever, considerably enlarged, and ulceration of them being still more rare.

The prognosis of continued chronic muco-enteritis is in the main unfavourable, though the fatal termination may be long delayed; and this fatal tendency depends not so much upon the severity of the disease as upon the circumstances under which it commonly occurs. We have already seen that inflammation of the lungs, or of the bronchial membrane, may arise in subjects in whom there is deficient power of repair, and that the disease may assume a disorganizing character in consequence; the result being the same as when it is accompanied by the deposition of tubercle: and so it may be in the bowels; common inflammation assuming much the character of strumous. Thus common inflammation of the mucous membrane may be excited by causes similar to those which induce the acute form of the disease, but from the enfeebled powers of the constitution repair may not be effected.

The treatment of chronic muco-enteritis must consist mainly in the removing every cause of excitement or irritation of the inflamed membrane. As the bowels are generally relaxed, there will seldom be occasion for laxatives; but should they not act for more than thirty-six hours, and should the evacuations contain pieces of solid matter, two grains of hydr. cum cret. may be given, and afterwards a tea-spoonful of castor-oil; or should there be no sickness the castor-oil, with tincture of rhubarb, may be administered (F. 67).* The frequent use of mercury is most pernicious; but if the bowels be irritable, and the motions pale, a grain of hydr. cum cret., with three or four of Dover's powders, may be given at night. When there is much tenderness, with signs of active inflammation, a few leeches may be applied to the seat of the pain, and afterwards a warm linseed poultice; provided always that the strength of the patient is sufficient to justify it. The soda with mucilage (F. 66) may also be employed, and if there be much diarrhœa the chalk mixture may be given occasionally. When the irritability of the bowels is excessive, about four ounces of starch, with thirty minims of laudanam, may be thrown into the rectum. The diet must be of the blandest and most soothing kind, consisting of soft farinaceous substances, a little plainly-dressed meat, if it do not cause uneasiness, and fowl or game, provided the latter be not "high." The drink should be barley water, or milk and lime water; or if there be not much flatulence, a draught of equal parts of milk and soda-water will often be found refreshing. When there is much exhaustion, a little arrow-root with brandy may be taken.

Tabes mesenterica, or, as it is sometimes more fitly called, *phthisis abdominalis*, consists essentially of strumous or tuberculous inflammation, of all the tissues of the intestines, and of the mesenteric glands.

This is a disease almost exclusively of infancy, childhood, or early youth. It may follow as a sequel of muco-enteritis, but otherwise the symptoms at its commencement are insidious and obscure. In the majority of instances there will have been previously-enlarged glands, tumid abdomen, or other signs of the strumous diathesis. The appetite of the child becomes capricious; there will often be an unwillingness to take food, alternating with an almost insatiable craving; his complexion becomes doughy, though the cheeks may retain their colour for some time. He afterwards begins to lose flesh, and the abdomen becomes more tumid, which is rendered more obvious by the emaciation of the extremities. There will be flushings of heat, more particularly towards evening, when there is not uncommonly a bright well-defined flush upon one or both cheeks. The bowels are irregular, the motions sometimes dry and friable, at others very relaxed, and almost always pale. The urine is loaded with urates, and often there is a stain of purpurine at the bottom of the vessel. The tongue is covered with a creamy coating, through which the elongated papillæ are conspicuous; the breath is sourish and offensive. If the disease be not arrested in its earlier stages, the emaciation increases, the abdomen enlarges, and considerable effusion often takes place into the peritoneal cavity. There are frequent attacks of diarrhœa, pus or blood being sometimes present in the evacuations; the hectic increases, and the patient sinks from asthenia.

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* (67) ℞ Olei Ricini,
Tinct. Rhei, āā ʒ iij.
Mist. Acac. ʒ iij.
Tinct. Opii, ♏ vj.
Aq. Pimentæ, ℥ vij.
Sumat coch. j. vel ij. ampl. p. r. n.

The treatment of this disease, to be effective, must be preventive; and the indications which we must endeavour to fulfil are, first, to correct the strumous diathesis, and secondly, to prevent the determination of that diathesis to the abdominal viscera. For this end, we must endeavour to prevent or counteract those circumstances which have been pointed out (p. 120) as tending to promote this diathesis, and in addition, the uses of the steel, wine, and cod-liver oil to the extent of a drachm of each three times a day for a child of four years may be had recourse to, the bowels being regulated as occasion may require. We have already pointed out that childhood is the period in which the viscera of the abdomen are in the state of the greatest functional activity compared to the rest of the system, and therefore the phthisis of childhood is often abdominal. Now, although we cannot dispense with the functions of the alimentary canal and mesenteric glands, we may do much towards the rendering those functions the cause of the least possible irritation to the organs themselves. Thus the diet should be of the simplest and the blandest character, as well as that which is the most readily digested and assimilated. Milk, as containing all the elements of nutrition in a fluid state, is peculiarly appropriate; but, in the earlier stages of the complaint, beef-tea, made according to Professor Liebig's recommendation, and even the gravy of roast meat, or the meat itself, carefully cooked, are admissible, as are also light farinaceous articles of diet.

When there is any febrile excitement, the iron and cod-liver oil must be suspended, and simple salines may be employed. In the more advanced cases, where there is much abdominal tumescence, and even fluctuation, we may often derive much benefit from the iodide of potassium (F. 68).[*]

We have already alluded to *diarrhœa* as produced by inflammation or irritation of the mucous lining of the small intestines, but, independently of this, it may arise from a variety of causes.

Among the first of these may be reckoned the overloading of the stomach, and the taking of food which is indigestible. This is the *diarrhœa crapulosa* of Cullen, and proceeds from the excessive secretion poured out in consequence of the irritation set up by the quantity or quality of the ingesta. The symptoms of this form of diarrhœa are griping, flatulence, sometimes nausea, a foul tongue, acrid or rotten-egg eructations, stools of unnatural appearance, very liquid, or even watery, with little or no fever or acceleration of the pulse.

Another cause of diarrhœa is mental emotion, especially fear, the effect of which in this respect is proverbial. A high temperature, again, has the same effect, perhaps by stimulating in the first instance the liver, the increased secretion from which excites that from the small intestines; be that as it may, we certainly find diarrhœa most prevalent in the hot months of summer and autumn.

The treatment of diarrhœa must depend, in a great measure, upon our knowledge of its cause, though it must be regulated upon the principle of excluding every source of irritation.

In the *diarrhœa crapulosa*, the purging will of itself generally remove the offending matters; though, if we are called at the commencement, we may favour the process by the administration of about a tea-spoonful of castor-oil, or the combination of rhubarb and chalk (F. 57, p. 399). After this a day or two's abstinence upon barley-water will complete the cure; though, if the bowels continue irritable, it will be well to give a gentle opiate.

In the case of diarrhœa from mental emotion, as also in that which arises apparently from season or external causes, the bland diet should be had recourse to, and if the disorder do not speedily subside, a little chalk-mixture may be employed. If the diarrhœa persists, vegetable astringents, and the aromatic confection may be administered (F. 69).*

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[*] (68) ℞ Pot. Iodidi, gr. iij.
Liq. Potassæ, ♏. xxiv.
Sp. Æth. nit. ʒ j.
Decoct. Sarsæ. co. q. s.
Ft. Mist. ℥ iij.

A table-spoonful of this may be given three times a day to a child of three years old.

It sometimes happens that the disease assumes a more severe character; the vomiting and purging being profuse and much tinged with bile, are supposed by some to consist mainly of that secretion, though there can be little doubt that it is largely diluted, as well by the exhalation from the alimentary canal as by a great flow of mucus from the biliary passages. With the purgings, are violent pains in the stomach and bowels, cramps in the abdominal muscles and in the legs, depression, and a tendency to collapse, with cold extremities and a feeble pulse. The exhaustion and collapse have sometimes been so great that death from syncope has ensued. This is the English cholera, or sporadic cholera, generally more or less prevalent in the autumnal months; but differing widely from the fatal epidemic, or Asiatic cholera, from which it may be distinguished by the evacuations being coloured, the urine not being suppressed, the tongue being warm, and, by the face and extremities, though showing signs of depressed circulation, not presenting the leaden colour and sodden feel of that fearful malady.

The prognosis of the cholera of this country is upon the whole favourable, though persons of feeble powers sometimes give way under it.

At the commencement of this disease, the best treatment is that recommended by Sydenham, and which is in principle that which has been so much insisted upon throughout this work, namely, the favouring of the subsidence of the irritation. Any attempt either to expel the offending matter by purgatives, or to lock up the acrid discharges in the canal, must be injurious; he therefore recommends emollient drinks; of these we possess an admirable one in the form of arrow-root.

If, however, the vomiting and diarrhœa continue obstinate, and we are rarely called until they have done so for a few hours, the best and safest plan is to give an opiate, of which the best form is a grain of solid opium with a grain of calomel. This may be repeated in four or six hours, or even less if the sickness and vomiting continue. Some cretaceous mixture may also be given after every alternate evacuation (F. 70).† If the extremities become cold and the pulse feeble, wine or brandy and ammonia should be given; and diligent friction should be used to the abdomen and extremities, when the cramps are distressing.

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* (69) ℞ Confect. Aromat. gr. xv.
Tinct. Cinnam. co. ʒ j.
Infus. Cuspariæ, ʒ vij.
Ft. Haust. bis vel ter die sumend.

† (70) ℞ Confect. Aromat. ʒ ij.
Vin. Ipecac. ʒ ss.
Tinct. Opii, ♏. xx.
Mist. Cretæ, ℥ iv.
Aq. Cinnam. q. s.
Ft. Mist. ℥ vj. de quà sumat part. 6^{tam} post. alternas sedes liquidas.

Dysentery is essentially an inflammation of the mucous membrane of the large intestines, and its effects are morbid secretions from the membrane with excessive irritability of the canal. Consequently we have—griping pains in the abdomen, generally referred to the course of the large intestine—excessive straining, and tenesmus,—slimy mucous stools, often tinged with blood. The acute form of this disease is attended with the fever of mucous inflammation.

When the inflammation is in the descending colon and rectum, the stools are very scanty, and contain little fæcal matter; when, on the other hand, it is nearer the cæcum, there is more liquid fæcal matter mingled with the blood and slime; the disease partakes, in fact, more of the character of diarrhœa, and has been termed *dysenteric diarrhœa.*

Dysentery is a very severe and often fatal disease in hot climates, and is one specially destructive to soldiers exposed to vicissitudes of weather in such situations.

It is by no means so common now, in England and the metropolis, as in the days of Sydenham; still, the wards of our hospitals present cases of acute dysentery, commencing in this country, though the majority are severe cases of the chronic disease in persons who have undergone the acute stage abroad.

The symptoms of fever sometimes precede those of the local affection, but more frequently the latter declare themselves the first. The fever is, at the commencement, that of active inflammation, but as it is also that of mucous inflammation in the abdomen, it soon assumes more of an asthenic character, and the pulse becomes compressible. Except the fever be great, the tongue may be natural.

The pain is often severe, though not generally constant, and there is usually more or less tenderness along the course of the colon. One most distressing symptom is the frequent desire to go to stool, which is not relieved by obeying the call. Sometimes the matter discharged is white slime, but more frequently it is tinged with blood, constituting what used to be commonly termed the *bloody flux.* Sometimes there is dysuria; and in very severe cases the stomach often sympathises, and there is vomiting. Whilst these symptoms continue, the febrile condition is kept up, and assumes a low typhoid form, and the patient may ultimately sink from asthenia.

The anatomical changes produced by this disease terminate in extensive destruction of the inner surface of the colon: this destruction, according to the observations of the late lamented Dr. Baly, commences in an affection of the solitary glands; an opinion also entertained by many, though not by all, who have observed the disease in tropical climates. "This form of malady,' according to Dr. Wilks, "begins by an enlargement of the solitary glands, which become raised above the surface and filled with a gelatinous-like substance. After a time these burst and an ulcer is left, the adjacent mucous membrane is involved, and the ulcers soon run together until large patches are formed: the intervening mucous membrane being inflamed secretes large quantities of mucus, and its hyperæmic surface is constantly bleeding. When the disease is epidemic and fatal, as occurs abroad, the mucous membranes may slough and the whole surface become gangrenous."* That this is a correct description of the severe and fatal form of dysentery, especially of that which has been observed in hot climates or amongst troops suffering from exposure and privation, there can be little doubt. It is however, on the other hand, probable, or more than probable, that the simplest form of dysentery, that, for instance, which may not uncommonly be met with in this country, is what we have before stated it to be, namely, an inflammation of the whole mucous membrane, affecting especially, as Dr. Wilks says, the follicles, and leading to great swelling, vascularity, and secretion from the membrane, and subsequently ulceration.

The causes of this severe form of the disease appear to be exposure to vicissitudes of heat and cold and wet, especially in hot climates, and in marshy localities. It is sometimes a sequel of ague, and certainly infests the same districts. We have already shown how dysentery may lead to disease of the liver. But in hot climates more particularly, ague gives rise to congestion of the liver, which, by obstructing the return of blood through the portal vein from the rectum and descending colon, thereby favours, hyperæmia of those parts, and consequently, dysentery. The causes of dysentery are brought as it were to a focus amongst soldiers engaged in active service, in hot climates and marshy districts, and therefore it has not been unaptly called by Sir James M'Gregor, "the scourge of armies." Under such circumstances, too, it appears in some instances to have assumed a contagious character.

The prognosis of the dysentery of hot climates must depend much on the character of the disease prevailing at the time. In this climate it is not often fatal, though it may be so in feeble constitutions, especially in children, and in young persons of strumous diathesis, in whom there would appear to be a tendency to scrofulous disease in the abdomen.

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* 'Lectures on Pathological Anatomy,' p. 303.

In the severe form of the acute disease, the plan recommended in the army has been, bleeding at the commencement, and immediately afterwards twelve grains of Dover's powder every hour for three doses; diluent drinks are to be freely given, and sweating encouraged for eight hours; afterwards, three grains of calomel and one of opium every alternate night, and in the intervening days two drachms of Epsom salts in light broth. The bleeding to be repeated if the pulse warrant it; Dover's powder to be given immediately afterwards, as a sudorific. The above plan embodies the principle of subduing the general inflammatory action, and obviating the local irritation.

When the disease has assumed a more chronic form, in which case it has probably proceeded to ulceration, laxatives and opiates should be given alternately, and soothing enemata administered. In the dysenteries of this country bleeding is rarely required; and when the disease presents itself in a severe form there is generally too much depression to justify it. In simple acute dysentery of this country, rest and fluid nourishment, with the administration of about 20 grains of the sodæ potassæ tartras of the Pharmacopœia, with 5 to 10 minims of laudanum in a draught, to be repeated every 6 or 4 hours, are often sufficient to restore the healthy action of the bowels in 3 or 4 days. For the latter remedy I am indebted to Mr. John Taylor, of the Old Kent Road, who called my attention to a notice of it in a French journal.

Leeches may be applied to the track of the colon, if the tenderness be great; or they may be, with much benefit, applied to the verge of the anus. Three grains of hydr. cum cret. may then be given, and two hours after that, half an ounce of castor-oil, with about three minims of tincture of opium. Warm baths, hot fomentations to the abdomen, and a few grains of Dover's powder night and morning should be employed; and if the disease continue, and the motions are pale, about two grains of hydr. cum cret. may be added to Dover's powder. When the febrile symptoms have subsided, the cusparia may be given as an astringent. In the severe forms of chronic dysentery, imported from abroad into the wards of our hospitals, the combination of copper and opium is a most useful astringent (F. 71).[*] The author is informed by

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[*] (71) ℞ Cupri Sulphat. gr. ij.
Opii. gr. iij.
Ext. Glycrrhiz. q. s
Ft. Pil. vj. sumat j. ter die.

Dr. Wilks that he has found that the greater number of such cases, of which many present themselves amongst the out-patients at Guy's Hospital, recover under the continued use of nitro-muriatic acid and laudanum.

The author has been favoured with the following account of dysentery, as seen in Peru, by Dr. Richard Whittingham, surgeon in the Peruvian navy, who was for several years in charge of the General Hospital at Callao. This gentleman divides dysentery, as he saw it, into five classes.

1. Dysentery arising from indigested food and retained fæcal matter.
2. Simple specific dysentery.
3. Dysentery complicated with enteritis.
4. Dysentery complicated with inflammation of the liver. acute or chronic.
5. Putrid, malignant, or gangrenous dysentery.

The first form not being peculiar to hot climates, we pass on to the remaining four, of which we give the account of the disease, as well as of the treatment, in Dr. Whittingham s own words.

"2. *Specific* simple dysentery, which may be subdivided into *common* and *bilious*.

"The *symptoms* are frequent calls to stool, with pain and tenesmus, sometimes passing nothing but mucus streaked with blood, and frequently large quantities of pure blood : the evacuations are attended by acute cutting pain across the bottom of the belly, over the pubic region. There is tenderness on pressure over the whole track of the colon ; slight fever and much thirst ; the tongue is covered with dirty fur, and in the bilious cases there is nausea and often vomiting, great prostration of strength, and the edges of the tongue yellow.

"*Treatment.*—I generally administer a draught composed of powdered ipecacuanha half a drachm to a drachm, mixed in a little syrup and water, the quantity of the ipecacuanha according to the severity of the case and the strength of the patient. It should be given fasting or early in the morning. The patient should lie in bed quiet, and not drink anything to excite vomiting. The medicine is not given as an emetic, but to produce its specific action on the disease. I then throw up the rectum half of the following enema night and morning—Radicis ipecacuanhæ contusæ, ʒj. aquæ ferventis lb. iss.—M. ft. infusio; cola et adde syrupi morphiæ ℥j. M. ft. enema. The ipecacuanha draught should be repeated every morning for three days : it generally causes but little vomiting ; but the second or third morning the dose produces copious bilious stools, which is the desired effect of the medicine. Under this treatment patients frequently pass very large quantities of vitiated materials from the bowels ; and often all dysenteric symptoms are at once relieved, and on the third or fourth morning a full dose of castor-oil should be exhibited,—and it should be a *full* dose. The quantity I generally give is from an ounce and a half to two ounces, mixed in the form of an emulsion. Small doses of castor-oil only irritate and do more harm than good in dysentery. Should, however, the case be an urgent one from the large quantities of blood discharged by stool, and not allow time for the above treatment, after the first full dose of ipecacuanha, I administer ten grains of ipecacuanha mixed with a grain of powdered opium every six or eight hours, and the enema of infusion of ipecacuanha night and morning, till the urgent symptoms are arrested; and this I have found much better than the acetate of lead and opium so highly extolled by some authors, in this form of the disease. Under this plan of treatment, though no blood now appears in the stools, a mucous diarrhœa, with tenesmus, often continues to harass the patient; and it is now that the vegetable astringents are of such infinite service I give the Granada or pomegranate bark in decoction in the following form:—Radicis corticis Granat. ℥ij. aquæ, lb. iss. Boil to a pint and strain, then add syrup of morphia ℥j., a wine-glassful to be given every four hours. The remaining symptoms will speedily diminish under this treatment. The patient should during the cure drink moderately of tepid rice water with plenty of gum arabic dissolved in it and sweetened to his taste. In very severe cases the only nourishment I allow is the white of an egg, beat up with a teaspoonful of powdered gum arabic dissolved in it, and sweetened with white sugar, mixed in a cup of hot rice water, and taken three times a day. The diet should be light throughout the cure. Under this plan of treatment, if the patient has been seen at all early, he is almost invariably well in a week or ten days, and relapses are of rare occurrence when common care in diet is observed."

"3. Dysentery complicated with enteritis.

"*Symptoms.*—In this form of the disease, in addition to the symptoms of simple dysentery, there is high fever, acute pain in the abdomen, increased on pressure. Often it is exquisitely tender. The patient lies on his back, with his knees drawn up, and cannot bear the pressure of the bed-clothes; the pulse is full and frequent, but rarely hard; there is extreme thirst, and the tongue is covered with dirty white fur. The features are pinched and anxious; the urine high coloured and scanty; and in the fatal cases the fever assumes the typhoid form, and the patient sinks."

"*Treatment.*—From the fever, fulness of the pulse, and, above all, the tenderness of the abdomen, which is frequently exquisite, general blood-letting would appear indispensable: and, indeed, these are the cases in which we are told to bleed freely and leech abundantly; but it is not so in the climate of South America, which is tropical; and we must always remember that in dysentery it is specific and not common inflammation with which we have to deal: indeed, so badly is bleeding borne in acute enteric dysentery here that in one severe case ‘having the fear of a lancet before my eyes,’ I was induced to order a dozen leeches to the abdomen: a poultice was applied to the leech bites afterwards, and they bled freely. The next morning I found my patient in such an alarming state of prostration, that it was with difficulty he was able to bear the subsequent treatment, and made a tedious recovery. The practice I adopt, in these cases, is to place the patient in a warm bath, 94° Fahr. for twenty minutes, and administer three of the following pills every six hours: hydrarg. chloridi, gr. xxx., pulv: opii, gr. iij., confectionis rosæ, ʒi, m. ft. massa, et divide in pil. ix. Six hours after the last dose of calomel and opium a full dose of castor-oil, from an ounce and a half to two ounces, in emulsion, the abdomen to be freely fomented with flannels wrung out with warm water; and if the tenesmus is urgent, which it generally is, an injection of starch and laudanum thrown into the rectum. If the castor-oil is vomited it should be repeated six hours after the first dose, and the effect is a copious discharge of bilious stools, with the immediate relief of all the urgent enteric symptoms. When these have subsided, and the disease has been reduced to simple dysentery, it may be treated by ten-grain doses of ipecacuanha and a grain of opium every six or eight hours; and finally, when all inflammatory symptoms have disappeared, and mucous diarrhœa, with tenesmus, remains, the decoction of pomegranate and syrup of morphia, as in simple dysentery. The mercury thus administered rarely produces ptyalism, and the patient generally makes a rapid recovery.

“4. Dysentery complicated with acute or chronic inflammation of the liver.

“*Symptoms.*—In addition to the symptoms of simple dysentery, there are pain, in the right side, increased by pressure or by a deep inspiration, sympathetic pain in the right shoulder, sometimes a yellow tinge in the conjunctiva, high-coloured urine, &c.

“*Treatment.*—These cases bear depletion better than either of the others, and the whole attention of the practitioner should be directed to the affection of the liver, regarding the dysentery as only a symptom of the deranged state of the portal circulation; but I rarely use the lancet, preferring topical bleeding by leeches over the region of the liver, and applying a cupping-glass over the bites, which has many advantages over the use of poultices; for you can regulate the quantity of blood taken with greater exactness, and it does not make such a mess in the bed. The bowels should be first cleared out with calomel and rhubarb, ten grains of each, followed by a full dose of castor-oil, and then mercury given in divided doses at intervals, till slight ptyalism is produced; and when the inflammation, or congested state, of the liver has been reduced by these measures, the dysentery subsides; or you may administer ipecacuanha as in simple dysentery; but it is plainly obvious that until the morbid state of the liver is rectified, no permanent advantage can be expected from specific remedies.

"5. Putrid, malignant, or gangrenous dysentery.

"There is a variety of this disease called gangrenous, from the tendency of the intestines to pass into a state of gangrene. This disease is well described by Dr. Cornuel, who published an account of it when it ravaged the island of Guadaloupe, in the West Indies, in 1837.

"*Symptoms.*—The evacuations of bloody mucus are very frequent, and contain fibrinous exudations from the mucous coats of the large intestines. These have the putrid odour of gangrene strongly marked; also the room in which the patient is smells strongly of it. The breath of the patient, too, is impregnated by it; the abdomen is not very painful, but greatly distended by gases; the tongue is loaded with blackish fur; fœtid sordes accumulate about the teeth and lips. The features are changed and sharpened; there are great prostration of strength and hiccough, a viscid cold sweat; and death rapidly ensues. This is the most terrible form of tropical dysentery: it is very common in the interior of Peru, and even in Lima, but is hardly ever seen on the sea-coast: it is highly infectious.

"*Treatment.*—The remedy which, in these cases, acts like a charm, is nux vomica combined with opium, in the following formula: Extract. nucis vomicæ, gr. iv. ad xij. Pulveris opii, gr. ij. M. fnt. pilulæ iv.—One to be taken every three hours. The quantity should be gradually augmented to twelve grains of the nux vomica, that is, three grains for a dose, according to the circumstances of the case. Mucilaginous drinks, and enemas of decoction of radix altheæ, with solution of chloride of soda. When the patient has passed from the extreme state of danger, his case should be treated according to the symptoms that may present themselves. I am quite ignorant of the mode in which the nux vomica acts, but its administration has saved numerous cases from the very jaws of death. Of a very large number of cases treated on these principles, in the hospital, the deaths did not average more than two per cent.; but I do not include in this calculation those unfortunate cases in which, from neglect or previous bad treatment, ulceration of the colon had been allowed to take place. In such cases I found the sulphate of copper, in doses of two grains, made into a pill, with half a grain of extract of opium, and taken three times a day, a remedy which in many cases proved successful. Ipecacuanha has often been extolled as a remedy for dysentery; but I am not aware that its use, in the full doses I have been in the habit of employing it, with such almost certain success, is generally known. The pomegranate rind, no doubt, owes its astringent virtues to the tannin it contains. It is a singular fact, that in those countries where dysentery most prevails, both ipecacuanha and the Granata or pomegranate tree are indigenous; the bane and antidote spring from the same soil, and exhibit a remarkable provision of nature."

XXII.

COLIC.—INTESTINAL CONCRETIONS.—ENTOZOA.

Colic is a disease which, as regards the bowels, is in many respects analogous to asthma, as regards the lungs. Like the former, it presents several of the symptoms of disordered function induced by inflammation, but it is not inflammatory in itself, and is unconnected with inflammation, unless the latter occur as an effect, or as an accidental complication.

The symptoms of colic are, severe twisting pains in the abdomen, referred particularly to the umbilicus, the bowels being obstinately confined; there is generally considerable flatulence, and often nausea. The pain is relieved by pressure, and the patient may often be seen to press his hands upon the abdomen for that purpose; the pulse and tongue are unaffected. The symptoms will often subside upon a free evacuation of the bowels, but if that do not occur. the pains will be more severe and constant, the abdomen tender, and the case will pass into one of obstructed bowel, or of ileus or enteritis

As in the case of asthma, there are no anatomical changes connected with colic *as such*, the colon is found firmly contracted in one part, and largely distended in that immediately above or tergal to it: this appearance is commonly explained upon the hypothesis of spasm of the former part, and paralysis of the latter; and in ordinary cases this is probably the most satisfactory explanation, though it must be recollected, that if there be sudden stoppage of the bowels from any other cause. and the same may be true of paralysis, there will be contraction beyond it.

The causes of simple colic are, cold applied to the surface, more particularly the abdomen and lower extremities, accumulations of hardened matters, hysteria, spinal disease. It is, in fact, a nervine affection, in which the paralysis or irritation may originate from the spinal cord or the brain; or it may be excited by an impression upon the incident nerves, as in case of cold to the surface, or irritating substances in the bowel itself.

There is, however, one form of colic the history and symptoms of which clearly indicate its nervine origin, and that is the Colica Pictonum, familiarly known as *painters' colic*, or *Devonshire* colic, or dry belly-ache of the West Indies, and in all cases it has been traced to the gradual introduction of lead into the system. In Devonshire it has often arisen from the use of cyder, the common drink of the country people, which had been prepared in machinery in the joints of the several parts of which lead had been employed, the acetic and malic acids of the apples having formed soluble salts with that metal.

This disease commences with the same symptoms as the ordinary colic, but it does not end with them. It may be just after one of these attacks, or it may be during a second or a third, that one hand or both of them *drop*, as the workers in lead term it, so familiar are they with the fearful malady. About the same time with these symptoms another and very remarkable one presents itself, for the acquaintance with which the profession is indebted to the late Dr. Burton of St. Thomas's Hospital. This is a bluish or purplish line along the edges of the gums. The immediate cause of the phenomenon is the deposition of sulphuret of lead, the sulphur being probably furnished by animal matters admitted into the "tartar" that forms on the teeth, or the sulpho-cyanic acid in the saliva; the lead is from the salt of that metal which has entered the circulation.

The palsy is the first amongst the nervine symptoms, but it is not the only one. Sometimes there are at the commencement pains in the head, and sometimes cramps. In severe cases, generally those in which there have been several attacks of the colic, the paralysis extends to the lower extremities, and the sufferers become miserable cripples. Frequently there are at the same time pains in the limbs, often called rheumatic, but which close inquiry into the history of the case, and inspection of the gums, show to be lead-poisoning. The paralyzed muscles waste, and the patient loses colour in the face and lips, one effect of this poison being apparently that of diminishing the quantity of red corpuscles; and he either dies of general paralysis, or is carried off by some visceral disease.

The diagnosis of colic is not difficult. As long as it is *only* colic, it may be distinguished from the other diseases of which we have spoken, as interrupting the functions of the bowels, by the absence of their characteristic symptoms; when these present themselves, it ceases to be colic.

The prognosis of a first attack of colic is favourable; recurrences of lead-colic will terminate, sooner or later, in the manner above described.

Ordinary colic is best treated by calomel and opium: about a grain of each may be given every three hours for three or four doses, after which half an ounce of castor-oil may be administered ,and an enema of soap and water employed, or the patient may be put into a warm bath, and about a quart of the water thrown up into the bowels. If, however, there be evidence of active inflammation, with a hard pulse, blood may be taken from the arm: this, however, is a measure that should not be unwarily practised in lead-colic, since the abstraction of blood favours the absorption of the poisons into the system, and aggravates the tendency to anæmia, which is one of its effects.

The treatment of the paralysis is far more difficult. The best plan is to put the dropped hand on a splint. A blister may be applied to the arm, and one-eighth of a grain of strychnia, well rubbed up with two grains of tragacanth powder, sprinkled upon the excoriated surface. The strychnia may sometimes be given internally, if its effects are carefully watched, in doses not exceeding a twentieth part of grain. Electricity, and the electro-magnetic current will also be found valuable adjuncts.

Various means have been suggested for eliminating the poison from the system. Mercury has been recommended, but is worse than useless. Nitric acid has appeared to be beneficial; but perhaps the most benefit has been obtained from the iodide of potassium.

INTESTINAL CONCRETIONS.

Another cause of disease in the intestinal canal is the presence of what may be regarded as foreign bodies in the form of intestinal concretions. We have already alluded to the formidable mischief arising from solid bodies in the appendix vermiformis, consisting commonly of phosphate of lime secreted by the mucous membrane, and deposited upon a nucleus either of fæcal matter, or of some accidental substance, as a cherry-stone or even a pill. Large calculi may also form in other parts of the canal, much in the same manner, and cause obstruction to the passage of its contents. They have been found most commonly in the cæcum and colon, though sometimes in the stomach. These concretions have been very frequently noticed in Edinburgh, owing to the husks and beards of the oatmeal, so much used by the poor in Scotland, cohering and forming a nucleus about which animal matter and saline particles have accumulated; and the same may arise from the aggregation of any substances which are incapable of solution by the gastric juice. A gall-stone which has escaped into the intestines may also become the nucleus of such a concretion, and so may magnesia, or the bran of wheat in brown bread. It is doubtful, however, if these accumulations are generally the original cause of the disease, as it is not probable that such foreign matters would long be retained in a healthy intestine, though it is almost impossible to say how long they may remain in an intestine of which the contractility has been injured by disease in any of its tissues. Thus, a case occurred many years ago in Guy's Hospital, under the care of Dr. Bright, when the author was clinical clerk to that distinguished physician, of a young man, a sailor, who was suffering much from abdominal pains, and in whom there was considerable tumescence in the left iliac fossa, simulating a well-defined tumour. This tumour was reduced by the administration of aperients; but upon their repetition, small bodies were observed, which proved to be fig-seeds: these were by repeated aperients removed in great quantities, and the swelling subsided. It was ascertained, moreover, that the lad had eaten large quantities of figs when at Smyrna, two months before his admission into the hospital, but had had none since he left that port. The patient, however, died about two years afterwards in Guy's Hospital of chronic peritonitis. Many years ago a little girl, a patient of the author's at the Surrey Dispensary, had severe pain in the right hypochondrium, with obstructed bowel and obstinate sickness. As she rejected all food and medicines, little or none was given her, except occasional small doses of calomel with opium. She emaciated, and death from asthenia appeared to be imminent, when a hard mass was detected at the anus. This was with difficulty removed, and appeared to be a concretion of the size of a small orange. Several of the same kind followed in the course of a few days, and the patient gradually recovered. She afterwards, however, suffered from several attacks of what appeared to be subacute peritonitis; and when last seen, about six years after the occurrence mentioned above, was a strumous, delicate girl of fourteen, with a tumid abdomen. The nucleus of some of the concretions appeared to be the bran contained in the "pollard" which composed some bread which she had been in the habit of eating.

INTESTINAL WORMS AND ENTOZOA.

We meet, again, with another class of bodies in the alimentary canal, the mucous passages, and some of the solid viscera, which bodies have an independent vitality of their own; these are the intestinal worms, or entozoa. Of these the four kinds most commonly observed in the human subject are—the *tænia solium*, or tape worm; the *ascaris lumbricoides*, or round worm; the *ascaris vermicularis*, or thread worm; and *tricocephalus dispar*. It will doubtless be remarked that in the above enumeration the well-known hydatid, the echino-coccus hominis does not appear, the fact being that these globular or vesicular worms do not constitute a distinct species, but are nothing more than imperfectly-developed long worms, although it has not yet been clearly shown to which variety of the long worm the common hydatid properly belongs. This discovery was first made by Von Siebold and Küchenmeister. These observers, says Dr. Wilks, have shown that the vesicular worms, such as hydatids, are but the immature forms of the long worms; and although the relation between these two varieties in the human body has not yet been accurately ascertained, yet experiments on the lower animals have shown their intimate connection. The perfect animal, or long worm, which has sexual organs, lives in a part of the body containing air; while the incomplete animal, as the hydatid, is developed in a solid or parenchymatous organ.*

The *tænia solium*, or tapeworm, is sometimes several feet in length, and consists of a great number of segments articulated to one another, which are flat and of a quadrilateral and rectangular form. The pieces are smaller, narrower, but longer, and more closely connected near the head, but toward the middle of the creature they become broader, and more distinct from one another. Each of these segments is hermaphrodite, containing sexual organs, and discharging an immense number of ova. These segments are not, however, independent of each other, since they are united by a common intestinal canal, through which they receive their nourishment from the head, which derives it from the intestine by means of suckers, of which there are four. The head consists of a long flat filament, with a projection at the end on which are the suckers, and a crown of hooklets in the midst.

Tricocephalus dispar.—These are small hair-like worms, from one to two inches in length, mostly found after death, which, it is said, they nearly always may be if the intestines be carefully searched. They chiefly infest the cæcum.

The *ascaris lumbricoides* is a round worm, closely resembling, in size and external appearance, the common earth worm, so much so, that it used to be thought identical with it. Its chief habitation is the small intestines, where it is originally developed, and is sometimes found in considerable numbers; but after death, as well as during life, it may pass into any part of the intestinal canal, or into any of the mucous canals communicating with it.

The *ascaris vermicularis*, or well-known thread worm, is developed chiefly in the rectum.

We may merely mention by name the remarkable microscopic parasite—the *trichina spiralis*, inhabiting the voluntary muscles, first noticed by Mr. Hilton, and afterwards described more fully by Professor Owen; and the *Filaria medinensis*, or *dracunculus*, which attacks the subcutaneous areolar tissues of the inhabitants of the inter-tropical regions of Asia and Africa; it especially infests the coast of Guinea, whence its name of Guinea worm. The former of these is at present rather a subject of pathological, or rather zoological curiosity, than the object of medical practice; whilst the latter, as regards treatment, belongs to the province of the surgeon.

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* Wilks' 'Pathological Anatomy,' p. 308.

Besides these there are filaria which infest the eyes and bronchial glands, though these are very rare. There is also a *strongulus* which has been found in the kidneys, of which a remarkable specimen, Strongulus gigas, is preserved in the Hunterian Museum. This parasite is more common in many of the inferior animals. When present, it produces the symptoms of a foreign body in the kidney.

The symptoms arising from the presence of worms in the intestinal canal are exceedingly various, so that none can be relied upon as diagnostic; though it is, nevertheless, certain that they do give rise to a number of morbid symptoms, the interpretation of which is uncertain, owing to the possibility of their being produced by other causes. The diagnosis, in short, admits of no proof, unless some of these entozoa, or portions of them, be seen in the evacuations.

The generally-received symptoms are belly-ache and abdominal tumescence, picking of the nose, itching of the anus, capricious, variable, and sometimes insatiable, appetite. Sometimes, again, they produce strange and anomalous symptoms by a reflex irritation of the nervous system, and are in this way often the cause of convulsions in children, and sometimes of epilepsy in adults.

When there is a tænia solium, or tapeworm, within the alimentary canal, there are in most cases uneasy feelings at the pit of the stomach, generally relieved by eating, in which respect they differ from many of the pains of dyspepsia observed in that situation. There are also the itching at the nose and anus, and capricious appetite already alluded to, with colicky pains, giddiness, flatulence, and not unfrequently loud explosive expulsions of flatus. The only certain symptom, however, is the presence in the stools of joints of the animal.

The only cure consists in the entire expulsion of the worm. For this purpose a variety of remedies have been recommended, many of which have not sustained their reputation. A very effectual medicine, and one which has long been much used in this country, is the oil of turpentine. This may be given in a dose varying from half an ounce to two ounces, either together with castor-oil, or followed by half an ounce about an hour afterwards. The plan which we have generally recommended in using this medicine is the taking an ounce of the oil of turpentine in the morning, fasting, and half an ounce of castor-oil an hour afterwards. There are, however, objections to this remedy, besides its nauseousness; that it causes a sort of giddiness, like that of alcoholic intoxication, and is apt to produce sickness, dysuria, and even strangury. There is also even greater danger from its stimulating effect upon the kidneys, hæmaturia having followed its use in more than one instance that has come within the author's observation. With a view of avoiding this latter danger, it is better to give large doses of the oil. The best remedy, however, is the oil of the male fern, in doses of from one drachm to one and a half, given with two drachms of mucilage of acacia in a wineglass of water, before breakfast; after taking it, the patient should be kept quiet in bed. Kousoo, a remedy imported from Abyssinia, has also proved very efficacious: it has been extensively tried at Guy's Hospital, and with almost uniform success. It has, however, the objection of being bulky, and very expensive, three or four drachms of the powder being an ordinary dose.

The symptoms produced by the ascaris lumbricoides are said to be much the same as those from the tænia, with the addition, perhaps, of greater emaciation. It is worthy of remark, however, that they have sometimes been unexpectedly voided by persons who have experienced no sign of their presence.

These worms are most tenacious of their place of abode, though various remedies have been vaunted as infallible for their expulsion. The best treatment consists in the occasional exhibition of a purgative of calomel and scammony, and administering three times a day about ten minims of the tincture of the sesquichloride of iron.

The symptoms produced by the ascarides vermicularis are irritation about the rectum, especially in the evening, and after going to bed. They chiefly infest children, those especially with a tendency to scrofula, and tumid bellies. The best remedy, in addition to those directed against the constitutional diathesis, is the injection either of lime water, or of half an ounce of tincture of sesquichloride of iron in half a pint of water into the rectum.

XXIII.

DISEASES OF THE LIVER AND ITS APPENDAGES.

When treating of the diseases of the lungs we had occasion to observe the great assistance to be derived from what has been technically termed physical diagnosis : into the principles of that mode of determining deviations from the normal or healthy condition of any viscus we will not again enter. To the liver, however, this method is applicable only in a very limited degree. We can indeed, by percussion and manipulation, detect variations from the normal size of the organ ; but we as yet possess no further means of determining structural changes in its texture except the constitutional derangement arising from inflammatory or other disease, as such, and the disturbance arising from the defective or perverted performance of its functions, or, in other words, the *læsa partis functio* of Cullen.

Since the variations of size are the only anatomical changes which are in any way directly cognizable to our senses, it becomes a matter of considerable importance to determine from what morbid causes enlargement may arise.

As a preliminary, however, we must make ourselves familiar with the size, form, and position of the liver in its normal state. According to Dr. Bright, the right lobe exactly fills the hollow formed by the diaphragm, not descending below the margin of the ribs, and extending upwards between the sixth and seventh ribs on the right side. The left lobe usually extends to the soft space below the ensiform cartilage, a short way into the left hypochondriac region. The liver is liable to deviations from its normal form, which are apt to cause great difficulty in the clinical examination of the patient. Thus Frerichs gives examples of quadrangular and rounded livers arising from congenital malformations. Malformations of an equally variable character may also arise from disease of the tissues of the organ, from compression from without, by disease or deformities in the thorax, &c. Independently of tumours, carcinomata, echinocci, and abcesses, the diseases which especially affect the form of the liver are congestion, arising from obstructed pulmonic circulation, the lardaceous liver, and the chronic inflammation which terminates in cirrhotic degeneration: the latter usually occasions an undue contraction of the left lobe, and a retraction towards the right side; so that a portion of its lower margin is thus seen lying across the scrobiculus cordis when the body is opened, and is frequently the only part of the organ which is visible. This statement should, however, be corrected by the remark of Dr. Frerichs: that the position of the lower margin is liable to be very variable even in healthy persons, owing to the great varieties in the form of the liver, and to abnormalities in the configuration of the lower part of the thoracic walls. In females especially, the lower margin is apt to project beyond the edge of the ribs, more than in men, owing to the smaller size of the female thorax.

This remark is also applicable to children, because in them the organ, and particularly the left lobe, is relatively larger, and because the thorax does not undergo great development till the age of puberty, nor does it attain its full capacity till some time after that period.

Congestion of the liver is among the most frequent of its morbid conditions. This may arise in various ways; and as the probable course of the disease will depend mainly upon the cause from which it has arisen, and our treatment must also be in a great measure regulated by our knowledge of it, we may speak of the different forms of congestion in the order of their causes.

The most common cause of congestion of the liver is obstruction to the exit of the blood from the venæ cavæ hepaticæ, arising, in the majority of instances, from disease within the chest inducing obstruction to the circulation through the right heart; though it may also be produced by other causes, as obstruction in the vein itself. The first consequence of this is engorgement and congestion of the branches of the venæ cavæ hepaticæ, constituting what was termed by Mr. Kiernan hepatic-venous congestion, giving to the liver a mottled appearance (the earliest presented in the so-called nutmeg change or degeneration), the centre of the lobules, only, becoming red from congestion of the hepatic twigs originating from them, whilst their margins remain pale.

This congestion must, of course, spread itself in a direction contrary to that of the circulation, that is to say, from the heart, or into the capillaries communicating with the twigs of the branches of the portal vein, by which the dark-red colour spreads towards the circumference of the lobules; so that where the twigs of one lobule are continuous with those of a contiguous one, the dark colour extends from one to the other. The liver will still present a mottled appearance; though the deep-red colour will preponderate more than in the former stage.

When this congestion has been long continued, the liver becomes sensibly enlarged, its margin descending below that of the ribs sometimes as much as two or three inches.

The second stage of the mechanical or hepatic-venous congestion is rarely attained unless there be a persistent cause of obstruction to the return of the blood through the cava. The branches of the portal vein likewise become congested, and the secretion of bile impeded, the effect of which is that those parts which are not reddened by the congestion become tinged with yellow by the retention of bile. When this is the case, the liver becomes still more enlarged, often descending as low as the crest of the ileum, and the complexion of the patient becomes dusky, and the conjunctivæ tinged; the urine also is high-coloured, loaded with urates and purpurine, and scanty. The alvine evacuations are sometimes pale, but more frequently dark or green. This state of the hepatic circulation will often give rise to effusion into the peritoneum; œdema of the lower extremities is a frequent concomitant, though it is produced directly by the disease in the chest, rather than through the medium of the liver.

It is stated by Dr. Budd that this condition of liver is attended by little or no pain beyond the feeling of weight and distension in the right hypochondrium; and it is probable that such is in most instances the case; though it not uncommonly happens, that where, as in cases of acute bronchitis supervening upon chronic, or upon valvular disease of the heart, the liver becomes rapidly congested, there is intense pain across the epigastrium, especially upon the right side: this can hardly be explained otherwise than by the tension of the proper and peritoneal coats of the liver, from the sudden enlargement of the organ.

The diagnosis of this form of congestion,—the hepatic-venous congestion of the liver,—must rest mainly upon our knowledge of the state of the circulation within the chest. When, therefore, there is enlargement of the liver (to be detected by percussion or manipulation), with scanty urine of high specific gravity, or depositing purpurine or urates; and when, at the same time, there is disease of the heart, or of the bronchial tubes, such as has been already shown to produce engorgement of the liver, we may infer that there is the mechanical or hepatic-venous congestion: if also we have reason to suspect that obstruction exists in the ascending cava itself, extending as high as the entrance of the hepatic veins, we may expect a similar result. We lay some stress upon the diagnosis of this form of liver disease, and upon the necessity of referring it to its true cause; because, when the enlargement of this organ is detected during life, or the changed appearance produced by the congestion noticed after death, there is still, in the minds of many practitioners, a tendency to regard the often more palpable lesion as the primary and causative, and not, as it really is, the secondary one.

The prognosis of this disease, like the diagnosis, must depend upon that of the primary lesion; but at the same time it must be remembered that its existence is a proof of the serious nature of the latter, and tends to render the prognosis more unfavourable. When the cause of the venous obstruction is capable of subsidence or removal, as in the case of bronchitis, the congested liver will, with the reparation of the original lesion, diminish in size, and return to its natural condition.

The treatment of the hepatic affection, in addition to that which is directed to the primary, must consist of cupping at the margin of the liver, diuretics, and purgatives. The latter are the most important; since, for reasons already explained (p. 26), the former class of medicines, when the circulation through the liver is impeded, will often, and that too in the severest cases, fail in their operation.

Where there is nothing to forbid it in the general condition of the patient, about eight ounces of blood may be taken from the margin of the ribs, and the bowels freely relieved by a few grains of calomel with jalap, followed either after a few hours, or the next morning, by the aperient draught of tartrate of potass and manna (F. 13); and subsequently one of the diuretic mixtures may be regularly administered. By these means we may frequently relieve the congestion of the liver, and diminish the obstruction in the chest from which it originated.

There is, as pointed out by Dr. Budd, another form of congestion of the liver, which, though it may be produced in extreme cases of that just described, is essentially of a more active character, and arises from over-stimulation of the secreting structure. It is not improbable that this form partakes more of the "portal-venous congestion" of Mr. Kiernan, though this in its simplest condition is stated by that gentleman to be extremely rare. Certain, however, it is, that congestion of the liver does occur in persons in whom there is not mechanical obstruction sufficient to account for its presence, and in whom its probable exciting cause is in the blood of the portal vein, which is overcharged with alcohol or with the products of imperfect digestion.

The anatomical change produced in the liver by the portal-venous congestion consists (according to Mr. Kiernan) in an increased injection of the twigs of the portal vein ramifying around the lobules, and of the capillaries in the margin of the lobules, leaving the central parts pale and uninjected; thus we have a pale mottling upon a red ground, as in the second stage of hepatic-venous congestion, though, according to Mr. Kiernan, the red is not of so deep a tint.

Another cause of active congestion is the absorption of unwholesome exhalation, such as the marsh or ague poison, which has notoriously the effect of producing congestion and enlargement of the liver. This is probably the congestion and chronic enlargement of Sir C. R. Martin, and other Indian practitioners. They describe the liver as large, coarse, and friable.

The diagnosis of this form of congestion of the liver is more obscure than of the other, which depends upon mechanical causes: in the absence of such cause, where there is enlargement of the liver, with scanty and dark-coloured urine, a jaundiced complexion and conjunctivæ, evacuations rather pale, or wanting the bright colour of healthy bile: and where there is a dull weight without acute pain in the region of the liver, with pain in the right shoulder or between the scapulæ, we may infer this form of disease of the liver.

The prognosis of primary congestion of the liver is doubtful; since, owing to the state of constitution in which it ordinarily occurs, there is but little tolerance of the means recommended above for relieving the venous congestion of the organ; and there is much danger of typhoid symptoms with extreme exhaustion supervening, as well as of coma from the retained secretion in the blood. The unfavourable symptoms are, a continuance of the icterode appearance, especially if purpura or œdema be superadded, stupor, jactitation, delirium, scanty urine, rapid and feeble pulse, with a brownish or dry tongue. The subsidence of the jaundiced appearance, the absence of cerebral disturbance, and an abundance of urine, with a reappearance of healthy bile in the evacuations, are favourable. It is possible that the unfavourable symptoms may arise in this disease from the obliteration or destruction of the secreting cells, giving rise to the fatal form of jaundice attributed by Dr. Budd to that cause, and which will be hereafter described.

The treatment of primary congestion of the liver must consist, in cases where the condition of the patient does not forbid it, of local depletion, mercurial and saline purgatives, and diuretics, and the nitro-muratic acid bath.

It will possibly be thought by many, and with apparent reason, that we have just been describing a form of disease which is merely hypothetical; but cases which we have witnessed have appeared to admit of no other explanation. For instance, a married woman of the age of twenty-five, who was stated previously to have been temperate and in the enjoyment of good health, became suddenly addicted to spirit drinking, soon after her husband, a master mariner, left her to go sea. After a few weeks she became slightly jaundiced, of a dusky colour; the urine dark, with considerable deposit of purpurine, though not of the dark colour which it has in ordinary jaundice; the evacuations were of a dingy brown or mud colour, and the liver with a rounded edge was to be felt considerably below the margin of the ribs on the right side. The patient had some delirium of an active but not furious character, and died in a state of coma. Upon inspection the liver was found large and coarse, and presenting much the appearance of the first state of the hepatic-venous congestion; there were spots of purpura on parts of the peritoneum; the tissues generally were full of blood, and the muscles lacerable; there were no other appreciable morbid changes. In this case the engorgement of the liver, though venous, could not have been of that form described as the hepatic venous, since there was no evidence of that obstruction to the circulation through the right side of the heart without which it is never found; neither could the jaundice, though fatal, have arisen from the yellow atrophy or gangrene of the cells of the liver, though the general symptoms closely resembled those attending that affection, since the liver presented anatomical characters quite the opposite of those belonging to the last-named disease. We are thus led as it were, *par voie d'exclusion*, to adopt the hypothesis of portal-venous congestion. A very similar case occurred in the clinical ward at Guy's, in a young woman of very intemperate habits, in whom there was considerable enlargement of the liver, with dusky jaundice, high-coloured but not *very* dark urine, and mud-coloured evacuations. The patient in this case recovered, under the use of saline purgatives and the nitro-muriatic lotion applied in the form of poultice. The diagnosis is of course conjectural, but in the absence of all those conditions which would cause obstruction to the circulation through the right side of the heart, it is not unreasonable to suppose the case to have been one of active portal-venous congestion.

Where we have reason to suspect the disease to have arisen from the too copious use of alcoholic drinks—and such has been the case in all the instances which we have seen—we must not venture upon the abstraction of blood. Otherwise, the taking about six ounces from the margin of the ribs by cupping may promote the cure of the disease. If, as is sometimes the case, the bowels are irritable, we must, of course, abstain from active purgation; but even when such is the case about four grains of hydr. cum cret. followed by two or three drachms of castor-oil, guarded, if necessary, by as many minims of laudanum, will generally be borne, and may have the effect of removing irritating matter from the alimentary canal. When this is not the case a combination of Pil. Hydr. and Pil. Coloc. co. may be administered every night or every other night, according to circumstances, and the sulphate of magnesia, with the carbonate once or twice a day. It may be well here to insist upon not giving mercury otherwise than as a purgative, and always so to combine it as to insure its purgative action; for there is no more pernicious practice than that of administering it indiscriminately in all diseases of the liver. If mercury have a direct cholagogue action when absorbed into the circulation, it cannot fail, when so absorbed, to increase the determination to the affected organ; but as it certainly has a tendency to diminish the cohesion of the tissues, a tendency which already exists in the majority of instances of retained secretion, we have a still stronger reason against its use, except as a purgative. When, however, it is so employed, it excites the secretion from the lining membrane of the small intestines, and by stimulating the part into which the bile is to be poured, affords the only safe means of relieving congestion of the secreting organ.

After the action of the bowels has been well established, or even in the intervals between the aperients, we may give the citrate of potass draught in effervescence, with about ʒ ss of sp. æth. nit.; to which may be added, where there is no sickness or great prostration, about fifteen minims of antimonial wine. When the symptoms begin to assume a less active character, the taraxacum may be used in combination with some diuretic (F. 72).* Should delirium or coma supervene, a blister may be applied to the neck; and when, as will sometimes be the case, the tongue becomes brown, or the pulse very feeble, or there are other signs of sinking, wine and stimulants must be freely administered; and this must be done earlier in those cases where they have previously been too largely used.

From the congestive we pass to the inflammatory diseases of the liver: adopting, with some modification, that given in the admirable work of Dr. Budd, into the—

I. Suppurative inflammation, or that which tends to suppuration and abscess.
II. Gangrenous inflammation.
III. Adhesive inflammation.
IV. Inflammation of the veins of the liver.
V. Inflammation of the gall-bladder and ducts.

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* (72) ℞ Ext. Taraxaci, ℈ i.
Sp. Æth. nit. ʒ ss.
Infus. Scoparii, ʒ xss.
Ft. Haust. ter die sumend.

To this there may be added, when the urine is not highly acid, Acid. Nit. dil. ʒ ss.

Or, ℞ Pot. Acetat. ℈ j.
Sp. Æth. nit. ʒ ss.
Decoct. Scoparii co. ℥ j.
Ft. Haust. ter die sumend.

I. **Suppurative inflammation of the liver** :—

Of this form of inflammation, the causes appear to be (1) mechanical injury; (2) suppurative inflammation of a vein, and consequent infection of the blood with pus: these abscesses are not, as used to be supposed, deposits of pus from the blood transuding through the walls of a vessel; but the product of a suppuration induced in the first instance by the lodgment of a pus globule in one of the capillaries of the part.

From the above cause of suppuration, the liver becomes affected only in common with other structures of the body; and is so affected next, in point of frequency, to the lungs, as being the next in regard to the quantity of venous blood passing through it, and the slowness of its progress: there is, however, another cause of suppuration which appears specially to affect the liver, and that is, ulceration of those parts the veins of which return their blood to the portal vein, to be thence transmitted through the capillaries of the liver; as, for instance, the intestines, stomach, gall-bladder, or gall-ducts. Of these conditions, that which is most commonly associated with abscess of the liver, and is, in fact, its most frequent cause, is dysentery.

The anatomical changes produced by suppurative inflammation of the liver, are, first, redness and softening; next, puriform infiltration, which is, however, of very short duration; and, thirdly, suppuration or abscess. This inflammation, in the words of Dr. Budd, "commences in the lobular substance of the liver, and is often confined to it; the capsule of the liver, the trunks, the vessels, and of the ducts being perfectly healthy. But if the inflamed part reach the surface of the liver, adhesive inflammation is generally set up in the portion of the capsule immediately above it, and coagulable lymph is poured out, which causes permanent adhesion between that portion of the liver, and the parts with which it is in contact."

Abscess of the liver does sometimes, though very rarely, occur in this country as a primary affection. An instance occurred to the author in the clinical wards of Guy's Hospital, in a young lad who was admitted with fever, tumour, and obscure fluctuation in the region of the left lobe of the liver; the constitutional symptoms being those of irritative fever. The diagnosis was a doubtful one of abscess in the liver, owing to the rarity of the disease. The lad died with low typhoid symptoms; and upon inspection, a large abscess containing more than half a pint of good pus was found, there being no other change, beyond slight irritation in the cæcum.

Chronic ulceration in almost any part of the bowels may lead to abscess in the liver. Of this an instance has occurred to the author within the last few days, in a man who died with abscess in the fundus of the liver, and ulceration in the lower part of the small intestines, some of the ulcers being old; there was previous history of frequent diarrhœa.

Abscesses in the liver vary in size from that of a pea to that of a cavity containing several pints; the contents of these abscesses are most commonly like those of ordinary phlegmonous abscesses, unless, as Dr. Budd observes, when, from communication with the lung, it becomes decomposed and fœtid from the admission of air. In abscesses occurring in subjects with but little plastic power, and in whom the disease is for the most part quickly fatal, there is no stroma or fibrinous lining to the cavity: but in the majority of cases, it is lined by a layer of false membrane, like a phlegmonous abscess. An abscess of this kind may remain for a long time stationary; but in most cases it follows the usual course, making its way towards the surface, ultimately emptying itself—it may be into the peritoneal cavity, and producing speedy death from peritonitis, though this seldom happens—more commonly adhesion is established between the liver and some adjoining viscus, as the stomach or colon, with which the abscess ultimately communicates by ulceration, or it finds its way through the diaphragm in a similar manner into the lungs, after which its contents are expectorated — or it reaches the surface, and points externally.

It may be very easy to lay down symptoms as diagnostic of abscess of the liver; but actual clinical experience teaches us that the diagnosis of this disease which, to say the least, is not common in this climate, is obscure in the highest degree. Dr. Budd, and we need cite no higher authority, says that "physicians who have had most experience in this disease confess their inability, in many cases, to distinguish it from other diseases of the liver; and in some cases even to pronounce that the liver is the seat of disease at all." *

The cases in which the symptoms are most clearly marked, are those in which the suppuration is the effect of a blow, or other direct injury. This usually takes place on the convex surface. "There is pain and tenderness in the region of the liver, and a sense of fulness and resistance under the false ribs, from increased size of the organ. The liver becomes enlarged, and if the abdomen be flaccid, and the intestines empty, its edge can be felt some inches below its natural limit. The secretion of bile may be suppressed or deficient, and the patient jaundiced. In addition to these symptoms, which may be called *special*, from their pointing to the liver as the seat of disease, there soon appear, as in simple inflammation of other organs, the general symptoms of inflammatory fever; the pulse is frequent and full, the skin hot, the tongue furred and yellowish; appetite is altogether absent, or much diminished; the patient is thirsty, and there is occasionally vomiting of bilious matter; while the urine is scanty, high-coloured, and deposits a red sediment." *

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* Budd on Diseases of the Liver.

When the above special and general symptoms concur after injury over the region of the liver, and there is no evidence of disease of the lung or pleura, we may infer suppurative inflammation of the liver. But, as Dr. Budd very justly adds, the liver is so well shielded by the ribs, that the disease is seldom caused in this way.

When, as is more frequently the case, suppurative inflammation occurs as the effect of puriform infection of the blood from remote injuries, surgical operations, or phlebitis, we can receive no assistance from the constitutional symptoms, since they exist beforehand, owing to the primary lesion; and we can only infer the existence of this affection from the special symptoms, pain in the region of the liver, and jaundice occurring in the midst of the general disorder. But even these may be absent, and then, as Dr. Budd says, "the abscesses in the liver can be discovered only after the death of the patient."

The diagnosis is not much more obvious in the case of abscess of the liver occurring during dysentery; it must rest mainly upon the special symptoms, pain and tenderness in the region of the liver, tension in the right hypochondrium, and jaundice; these symptoms may all arise under other circumstances, as from obstruction or inflammation of the gall-ducts, but when they arise *in the course* of an attack of acute dysentery, or in acute supervening upon chronic, the suspicion should be entertained of suppurative inflammation and abscess of the liver.

This view of the origin of abscess of the liver from ulceration of the lower bowel is not supported by the generality of Indian practitioners.

It may happen, however, that suppuration occurs without any of these symptoms; since this form of inflammation causes but little enlargement, at least before the formation of pus: and if there be no great extent of the organ involved, the enlargement will be scarcely perceptible. And as regards jaundice, we know that a portion only of the liver (as is also the case with the lungs and kidneys) is often sufficient for the depuration of the blood, and consequently when the inflammation is partial, there *need* be no jaundice. Again, we know that the parenchymata generally are not sensitive structures, and that when inflammation is deep-seated, it may go on to suppuration without being attended by any considerable amount of pain. Besides the above general and special symptoms, there are others occasionally observed, and which when they do occur, often continue after the feverish symptoms have passed: these symptoms are pain in the right shoulder, vomiting, a short dry cough, and permanent rigidity of the muscles of the abdominal parietes, but especially of the right rectus muscle.* Pain in the right shoulder occurred to Dr. Budd in five cases out of fifteen; of three which occurred to the author, it was absent in two, and present in the other. In one of Dr. Budd's cases, where the abscess was upon the convex surface of the liver, the pain in the right shoulder, which was intense, was relieved when the abscess was opened. Dr. Budd also confirms the statement of Dr. Annesley, that pain in the right shoulder is a sure sign of the abscess being in the right lobe.

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* Budd on Diseases of the Liver..

When hepatic abscess is the result of phlebitis, the more urgent symptoms are those of puriform infection generally, and the suppuration is as extensive in the lungs as in the liver, or more so; the patient passes rapidly into a typhoid state, and there is no opportunity for active treatment. Under such circumstances, the best that can be done is to support the powers, with the liberal use of wine, and serpentary and ammonia, and sedulously to apply hot fomentations to the affected part.

When the suppurative inflammation arises either from an ulcer, or from ulceration in those parts from which the blood is returned through the portal vein, the suppuration being confined to the liver, and the system generally not infected with the poison, there is opportunity at the commencement for more active measures: blood-letting may even be ventured upon when the pulse is full and hard; but, as a general rule, cupping at the margin of the ribs on the right side is to be preferred. There will always, no doubt, be some difficulty, from the obscurity of the diagnosis; but the same measures will be, to say the least, harmless, when the same symptoms arise from inflammation in any neighbouring organ. As regards the use of mercury, there can be little doubt that, except as an adjunct to an aperient, its exhibition in any stage of this disease must be positively injurious, since, in so far as it acts as a stimulant to the organ, its use is contrary to that most important rule in practice, of avoiding all excitement of an inflamed part, and when suppuration has taken place, it must have the same ill effect as in all suppurative diseases. In reply to the question of the expediency of opening an abscess of the liver, Dr. Budd very justly condemns the practice, except when it is evident from circumscribed œdema, or a slight blush on the skin, that union has taken place between the integument and the abscess.

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* Budd, op. citat.

In more chronic cases, the best practice to pursue is the use of gentle laxatives, as decoct. aloes co. with rhubarb (F. 45, p. 349), and when there is a tinge on the skin and conjunctiva, the use of nitro-muriatic acid with taraxacum.

II. Gangrene of the liver is an exceedingly rare affection, so much so as to be of but little importance in a practical point of view; and is chiefly deserving of notice from the circumstance of portions of the organ of a dark-green colour, with a very putrid offensive odour, observed near the margin of abscesses that have not become encysted, being frequently regarded as gangrenous; though the appearance is in reality the effect of decomposition, and also that gangrene does sometimes affect this organ. It never, according to the best authorities, occurs without gangrene of some other part.

III. We have already seen that adhesive inflammation may take place in the portion of the liver contiguous to an abscess, and the soft albuminous matter which lines the latter be again enclosed by a deeper layer of fibrinous lymph, which acquires a greater degree of hardness according to the age of the abscess; the adhesive inflammation in this case being confined to the neighbourhood of the abscess which excited it, though it may extend to the capsule, and to the peritoneal coat of the organ, and to neighbouring viscera. And we have already alluded to the fact of fibrinous lymph effused on the surface of the liver, falling down into the abdomen or pelvis, and setting up adhesions between other viscera. Adhesive inflammation of the liver may also be excited around hydatid tumours, and sometimes, though rarely, around cancerous growths.

There is another and most important affection, perhaps the most important disease of the liver with which we have to do in this country, commonly known by the name *cirrhosis*, and by Dr. Budd and other authorities regarded as the effect of deep-seated adhesive inflammation occurring, to a greater or less extent, in the substance of the organ, the lymph being effused almost entirely in the areolar tissue which accompanies the branches of the portal vein. Sometimes, according to Dr. Budd, this effusion is limited to the larger branches, which are surrounded by it to the distance in some parts of half an inch; these branches, however, remaining pervious, but some of the twigs which arise from them are obliterated, and the parts of the liver supplied by them atrophied, though others are apparently not affected: the neighbouring portion of the capsule is also puckered, and there are generally adhesions to neighbouring organs. It more commonly happens, however, that the effusion of fibrinous lymph extends to the areolar tissue forming the nidus of the small twigs between the lobules. The subsequent contraction of the lymph strangulates the vessels and ducts, puckers the capsule, giving to the surface of the liver the uneven appearance commonly known as hobnailed. The organ throughout is rendered paler than natural by the white fibrinous matter, and by the diminished quantity of blood caused by the strangulation of the vessels, whilst it is rendered yellowish by biliary matter detained in the cells. This condition gives to the organ the appearance of impure bees-wax, whence the name of cirrhosis given to the disease by the French authors. In other cases the contrast between the yellow biliary matter in the cells and the surrounding fibrous tissues is more marked, owing to the quantity of the latter being much greater, and by its stronger contraction drawing the liver in nodules, which appear like peas dispersed through the surface of the organ. Sometimes there is, in addition to this change, the deposition of oil-globules in the lobules, swelling out the latter, and rendering the organ more nodular, at the same time that it makes the lobular tissue softer.

Dr. Wilks, however, remarks, and with much truth, that "there is not proof in many cases that a lymph has been effused, but rather that the whole change is chronic;" though he adds, that "sometimes where the capsule is much thickened, and the organ is closely adherent to surrounding parts, the term hepatitis may with more propriety be used." Cirrhosis, however, in the generality of cases is, as he observes, essentially a slow or chronic affection, and an idea may be formed of its nature by the supposition of a tough fibrous tissue being diffused through the organ, which shall contract and squeeze the parenchyma into a number of nodules.

The anatomical condition upon which this cirrhosis of the liver depends being in the first instance the effusion of a substance which ultimately contracts—it follows, that the size of the organ so affected must undergo considerable variations, being in the first instance somewhat enlarged, and when fatty degeneration coincides with the cirrhosis, considerably so; but as the contraction of the fibrinous effusion goes on it becomes smaller, and is at last reduced considerably below the natural size and weight.

The cause of the inflammation, if such it be, inducing the changes above described is over-stimulation of the organ, this over-stimulation being in most instances produced by the character of the blood in the portal vein. The most palpable as well as frequent examples are found in the spirit-drinkers, unfortunately too numerous in our large towns; and it is remarkable that spirit-drinking produces the disease more speedily and certainly than does the use of alcohol in any other form, as wine or beer: in beer-drinkers there is, according to Wilks, a tendency to production of fat, so that the liver is found enlarged and containing a considerable amount of fat; but residence in hot climates, or even long-continued exposure to heat in the pursuit of various occupations, will greatly promote, if not induce, the same result, probably by calling into requisition the supplementary function of the liver by diminished activity of the lungs. A stimulating diet, confined air, and want of exercise promote the same result. This was remarkably exemplified in two fawns who were kept for some time at the back of Guy's Hospital, often getting fed upon linseed meal and other matters readily undergoing fermentation, and of course using (for them) but little exercise, and living in an impure atmosphere. These creatures both died of ascites from cirrhosis of the liver.

Cirrhosis of the liver usually creeps on insidiously, and the patient seldom comes under treatment so much for the disease in the liver itself as for the effects produced upon the rest of the system. In some cases, however, there is a more rapid onset, and there are symptoms indicative of inflammation, combined with those of rapid diminution of the secretion of bile. There is loss of appetite, nausea, and, it may be, sickness, pains in the limbs, and other symptoms of pyrexia, the skin and conjunctivæ become more or less tinged with bile, the urine high-coloured and loaded with lithates: there are pain and tenderness in the region of the liver, and the organ may be felt below the margin of the ribs, especially in those cases just alluded to as occurring in beer-drinkers.

When these acute symptoms do not present themselves at first, or when they have been subdued by treatment, or have spontaneously subsided, the patient makes no very distinct complaint, but gradually loses flesh and strength, and his skin becomes sallow and dry, the countenance sunken and dingy. After some time, generally several weeks or months, the new deposit contracting, the circulation through the portal vessels is obstructed, and the escape of bile is probably at the same time impeded; the effect of which must be both scanty secretion and delayed excretion. In the mean time the liver becomes smaller and smaller, in some cases exceedingly so, and the obstruction to the passage both of blood and bile through their proper vessels is almost closed. The effect of this closure on the portal vessels is obvious in various ways. There is a general exudation of serum from the extreme branches of the veins converging to form the vena portæ, and the consequence is effusion into the peritoneal cavity. This goes on increasing, generally without pain or tenderness. The amount to which this fluid increases is often such as to force up the diaphragm and impede the respiration, and also by pressure upon the ascending cava, to divert the returning blood into the superficial veins, and cause great enlargement of those on the surface of the abdomen ; these are still further distended owing to a portion of the portal blood finding its way by this course to the right side of the heart, having access to these veins from the hæmorrhoidal branches of the superior mesenteric vein, through the branches of the internal iliac which anastomose freely with the former. From the same cause the lower extremities become anasarcous, but not the upper or the face, which remains shrunken throughout. The portal obstruction likewise causes engorgement of the venous branches in the mucous membrane of the alimentary canal, resulting in hæmorrhage from the stomach and bowels.

The obstructed circulation through the portal system also prevents the absorption of fluid into the general circulation, and consequently the urine becomes scanty. This diminished absorption must, no doubt, induce a scanty supply to the whole system, and render the process of waste and repair much less, which may account for there not being more obvious ill effects from the diminished secretion of bile and urine. The blood is, however, materially disordered, as may be seen by the general tendency to hæmorrhage, spots of purpura or ecchymosis being rarely absent sooner or later, and besides the hæmorrhage from the alimentary canal above noticed,—which is due mainly to mechanical obstruction,—epistaxis, and bleeding from the mouth or gums, or from leech-bites, or the wounds of scarificators in cupping, are of common occurrence.

The diagnosis of this disease may be, in the onset, somewhat obscure, but the sallowness, feverishness, dull pain in the region of the liver, with a history of the use of spirits, where a correct account can be obtained, are pretty conclusive evidence, even before any of its more characteristic signs have begun to show themselves. But when, by the progress of the disease, we have the known results of obstructed circulation through the liver, such as ascites, scanty urine, and subsequent anasarca of the lower extremities, the diagnosis, especially in male subjects, is comparatively easy, especially when we can get an insight into the previous habits of the patient. The only diseases with which it can be confounded are enlargement of the spleen, chronic peritonitis, malignant disease of the liver or omentum, or malignant growths obstructing the portal circulation ; and, in the female, ovarian dropsy.

From enlargement of the spleen it may be distinguished by the previous history, by the absence of tumour under the left hypochondrium, aided by the persistence of the ascites, which often, in enlargement of the spleen, subsides, leaving the tumour, which may be recognized by its shape and the notch at its anterior edge. In chronic peritonitis there is often more tenseness of the abdominal walls, and the fluctuation is not so distinct. The latter disease often occurs in connexion with tuberculosis, of which we may find symptoms in other parts of the body. The hollow viscera, too, in hepatic ascites, will always float to the portion of the abdomen which is uppermost, according to the position of the patient, so that we have this part resonant and the rest of the belly dull upon percussion. This free movement cannot take place in peritonitis, owing to adhesions of the viscera to each other, and contraction of the mesentery; and consequently, there will not be the circumscribed area of resonance which we find in simple ascites, though the general resonance may be greater.

In cancer, of the liver or peritoneum, the effusion is rarely so great, the complexion has more of a dingy whiteness than of the sallowness of hepatic disease. In most forms of cancer of the liver we can feel the enlarged organ; it is nodulous, and the enlargement generally increases as the disease advances. The emaciation too, and general progress of the disease is more rapid; and there is generally evidence of the same disease elsewhere; and cancer is not a disease induced by intemperance. Very similar constitutional signs, with more diffused pain and tenderness in the abdomen, and a nodulous tumour in the epigastrium, which may be mistaken for a cancerous liver, but not very readily for a cirrhose one, will enable us to distinguish cancer of the omentum from the latter disease.

There is a form of probably malignant disease existing in the ascending cava, involving the kidney, and extending almost into the right auricle, described in the second volume of the second series of 'Guy's Hospital Reports,' which also produces great ascites, and even greater enlargement of the superficial abdominal veins, than does cirrhosis, from which it is with difficulty distinguished; but the diagnosis has been effected, and may be so by carefully considering all the effects which would ensue from simultaneous obstruction of the ascending and hepatic cavæ.

Ovarian dropsy is another source of difficulty, especially when there is a very large cyst; the previous history will, however, do much to guide us; added to which that the swelling is generally said to have commenced rather more on one side than the other, and the dropsy being encysted, the intestines are pushed on one side, and do not float up, and give a hollow sound in the centre of the abdomen, as when the fluid is in the general cavity. Hydatids, though frequently producing great abdominal enlargement, need never be mistaken for ascites.

In the treatment of cirrhosis we must act upon the knowledge that there is often an inflammatory affection of the liver; and that where this is the case we must endeavour in the commencement to arrest the inflammation, and promote, if possible, the absorption of the effused matter; but when this substance has contracted the organ is spoiled, although the disease may be at an end; and therefore we can only palliate the effects of the lesion, namely, obstructed portal circulation and diminished or almost obliterated function of the liver.

In the commencement local depletion may be employed, but with great care, for we have to do with those who, from previous intemperance, are intolerant of loss of blood, and liable to delirium tremens from its being carried too far. Cupping, however, over the region of the liver to about six ounces may be tried. Saline purgatives, as the sulphate with the carbonate of magnesia, may be used at the same time, and a grain of calomel with half a grain of opium and one-sixth of a grain of tartar emetic night and morning; but the mercury is to be used at first only in small doses, and with a view to arresting plastic effusion, not as a stimulant to the liver, for in so far as it has this effect it is mischievous. In the greater number of instances, however, we have to do with the confirmed cirrhose or "hob-nailed" liver, in which case art can do nothing towards the relief of the primary lesion, and our chief efforts must be directed to the relief of the ascites which is its consequence. The combination, calomel, squills, and digitalis (F. 63, p. 423), may be cautiously employed, the saline aperients, if necessary; and if the gums become in the slightest degree affected, or, if the digitalis appear to be depressing the heart's action, the pills should be withdrawn, and iodide of potassium administered in two-grain doses twice or thrice a day, and iodine ointment may be rubbed into the right hypochondrium. When however, these or other measures fail, a temporary relief may be obtained by tapping.

IV. The veins of the liver are liable to inflammation both of the suppurative and plastic kind, though rarely as a purely local affection; but this condition is found in most cases of general phlebitic abscess; of the former, the symptoms are not unlike those of the hepatic abscess; of the latter, they are even still more obscure and uncertain.

V. The mucous membrane of the hepatic system, like that in other regions of the body, is liable to different varieties of inflammation: these are divided by Dr. Budd, in accordance with the analogy of the same membrane in other organs, into 1, catarrhal; 2, suppurative; 3, croupal or plastic; and

4, ulcerative or mucous inflammation: and it is not improbable that this "bronchitis of the liver" may play as important a part in the diseases of the biliary apparatus, as does bronchitis in those of the respiration.

1. Catarrhal inflammation is, if we may judge from the analogy of other mucous membranes, most probably not an uncommon occurrence, and may perhaps account for many of the cases of simple jaundice which we meet with in practice; and the symptoms which we might expect to arise from such an affection would be slight pyrexia, dull pain in the right hypochondrium, and jaundice.

2. In severe cases the secretion of the mucous lining of the ducts becomes puriform, the matter secreted being often of a greasy character like pus which has been treated with an alkali, at the same time that it may be coloured by the bile. The symptoms are not very unlike what might be supposed to arise from an abscess in the liver.

The inflammation of the ducts may, by the turgescence of the submucous areolar tissue to which it gives rise, cause obstruction of the canal, as may readily be supposed when the narrowness of the canal is considered. When this obstruction affects the common duct there will be pain in that situation; the liver will be gorged with bile, and jaundice will ensue. It will also not uncommonly happen that a pyriform tumour presents itself in the right hypochondrium, which is the distended gall-bladder. If the inflammation involve only the hepatic duct, the symptoms would be much the same, but there would be no enlargement of the gall-bladder; but it does not necessarily follow that if the cystic duct be obstructed there need be none, since if, as is not unlikely, there be at the same time mucous inflammation of that sac, or if it be subjected to any other cause of irritation, its own secretion will be very considerable, and having no outlet will go on accumulating to an amount scarcely credible. In a patient of Dr. Babington's, in Guy's Hospital, the cystic duct had become obstructed, and the gall-bladder contained a quantity of thin mucus, which nearly filled a washhand-basin. The fact of the gall-bladder being capable of distension by its own secretion should be remembered as aiding diagnosis, and as tending to correct some erroneous inferences which may be drawn when it is found full upon examination after death.

3. Plastic inflammation of the mucous lining of the biliary passages is a very rare occurrence, and one with the clinical history of which we are unacquainted.

4. Ulceration of the gall-bladder and biliary ducts are perhaps among the most common forms of inflammation of those structures, and may be induced by various causes, though the

symptoms especially referable to the lesion itself are, as might have been anticipated, by no means well defined. Dr. Budd remarks that it has been noticed by several observers as one of the anatomical changes observed after death from remittent fever; and we have ourselves noticed it on more than one occasion in subjects who had died with typhus fever: in one instance the peritoneal coat which had been laid bare by the ulceration, gave way in gently lifting the gall-bladder. It is also very apt to be excited in those who have previously suffered from disease in the same situation.

Ulceration of the gall-bladder or ducts may, by perforating the peritoneum, allow the escape of the contents into the cavity of that membrane, giving rise to puriform peritonitis, which is speedily fatal. If indeed there have been closure of the cystic duct, and the gall-bladder, as before noticed, contain only the mucus secreted by its lining membrane, the escape being more gradual, and the extravasated matter not so intensely irritating, the extravasation may be circumscribed by adhesion. And the same will happen when the ulceration is set up by gall-stones, in which case the adhesion commonly precedes the perforation, the bladder or duct becoming adherent to some adjacent part, often the duodenum or colon, by which means the gall-stone passes into the intestinal canal. An ulcer in a large duct may find its way into a neighbouring branch of the portal vein, and then the consequences are most disastrous—bile as well as pus becoming mixed with the blood.

The symptoms which precede the ulceration are probably pain, loss of appetite, thirst, and some degree of fever, with weight and heat at the epigastrium, and when the inflammation has given rise to occlusion of the hepatic or common duct, intense jaundice.

The treatment of inflammation of the mucous membrane of the biliary apparatus must be in the main antiphlogistic—our object being to subdue the local inflammation, to remove the unhealthy secretion, and restore the health of the organ. The inflammation, however, is one affecting a mucous surface, and therefore depletion must be used with caution. With this end, leeches or cupping to the margin of the ribs have been recommended; but when, as is most commonly the case, there is jaundice (and in fact our diagnosis cannot be complete without it), the latter should be employed; indeed it may well be questioned whether it is ever justifiable to use leeches when there is jaundice, owing to the great difficulty in stopping the hæmorrhage which under such circumstances often flows from the leech-bites, and has been known in some instances to prove fatal. For promoting the expulsion of the accumulated mucus, we do not perhaps possess any remedies which can be strictly compared to expectorants as applied to the bronchial membrane; but certainly there is no more effectual method of promoting the flow of its secretion from the liver, than by exciting the action of the part into which it should be poured; for this purpose saline purgatives are well adapted, and there is no combination better than the sulphate with the carbonate of magnesia: when there is heat of skin, diaphoretics should be employed, and with them antimonials, if there be no sickness (F. 5, p. 109). Mercury is a much-abused remedy in all biliary derangements; and when there are any signs of pyrexia it should not be employed except so combined as to insure its purgative action; though it may be remarked that its employment in this disease is not directly in opposition to all rational principles of therapeutics, as it is when the substance of the organ is the seat of disease. The pills of blue pill and colocynth may, however, be given with safety when the bowels do not respond to the saline aperients. When all inflammatory action is at an end, moderate doses of pil. hydrarg. or hydr. cum cret. may be used at intervals, much on the same principle as we would employ stimulating expectorants in chronic bronchitis. Soda again, which is one of the constituents of the bile, and therefore likely to pass out of the system by the liver, is well fitted for such cases, since it is probable that it also corrects the character of the secretion in the ducts, by rendering it less viscid; an effect similar to that which is known to be produced by this and other alkalies in similar affections of the bronchial tubes. Taraxacum is another remedy which appears to modify the quality of the bile, and in affections of the biliary passages, which have assumed a chronic form, it is peculiarly applicable. It may, under these circumstances be combined with the soda, or liq. potassæ. In some chronic cases, it seems also to exert an admirable cholagogue influence when combined with nitric acid. Hydrochlorate of ammonia also is a cholagogue, the importance of which is hardly sufficiently appreciated in this country: after the bowels have been freely relieved by saline and mercurial purgatives it may be administered in doses of about ten grains (F. 73).*

As regards the chronic change in the liver, we have already spoken of cirrhosis; there are, however, two other important ones, the fatty, and the lardaceous or waxy degeneration, which deserve to be noticed, though it may be questioned whether either is to be regarded as a primary affection. There is, it is true, an increased quantity of fatty matter in the congested liver, and in other deviations from its healthy action, but besides this, there is a form of disease or degeneration in which the presence of fat constitutes the sole deviation from the normal condition. In such instances, "the organ is much enlarged, and of a white colour, the edges being rounded as if the tissues were crammed to excess with the adventitious matter."* The disease with which fatty liver is most commonly associated is phthisis; it is also not uncommonly found in those who have long been confined to bed with protracted disease.

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* (73) ℞ Ammoniæ Hydrochlor. gr. x.
Pulv. Tragacanth co. gr. x.
Aq. Cinnam. ℥ iss.
Ft. Haust. ter die sumend.

The *lardaceous*, or waxy liver, was long confounded with the fatty, and it is only lately that the distinction has been pointed out by Dr. Wilks. The deposit in this case appears to hold a position intermediate between fatty and albuminous material. This form of disease appears most commonly in scrofulous subjects, more particularly in young persons who have been long suffering with disease of bone. Another very remarkable and highly important lesion of the liver is the yellow atrophy of Rokitainsky, or acute atrophy of Frerichs, observed in connection with a fatal form of jaundice: but we defer the description of it till we come to speak of that disease. The liver is also liable to adventitious deposits, such as tubercle, which, however, rarely occurs except in cases of severe and acute general tuberculous disease, and to the different forms of cancer. Of the latter, the most important are carcinoma and the medullary, or soft, cancer. The former of these is a common affection of the liver, though it is rarely that we find it as a primary one: it often appears to be consequent upon cancer in its various forms affecting the other organs of the abdomen; and several preparations in our museums show that it may have arisen in the gall-bladder or ducts, and extended thence into the substance of the liver, the disease having been apparently excited in the first instance by the irritation caused by gall-stones.

The medullary or soft cancer is found in the liver, sometimes in large tubera as big as a small orange, sometimes infiltrated into the tissues of the organ. This form of disease often develops itself very rapidly, patients sometimes becoming affected with jaundice and an enlarged liver in which the tubera can be felt through the abdominal walls, in whom there were no signs of disease a few weeks previously; at other times a similar condition of the liver presents itself, with ascites caused by the obstruction to the portal circulation. So that if life be not destroyed by the asthenia resulting from the extensive cancerous disease, the patient may die from the pressure of the ascites caused by the obstructed portal circulation, or from the toxæmic effect upon the nervous system of the jaundice produced by pressure upon the ducts.

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* Wilks's 'Pathological Anatomy,' p. 319.

The liver is also a common seat of the hydatid echinococcus; indeed this organ appears to be the favourite habitat of that parasite. These sometimes cause death by jaundice or by ascites, like other tumours in the liver: they sometimes prove fatal by bursting into the peritoneum or even through the diaphragm into the pleura. Fortunately the hydatid sometimes dies, shrivels up, and remains an innocuous semi-ossified cyst.

We have already frequently alluded to jaundice as a symptom of various affections of the liver, whence it must be apparent that it is in reality nothing more than an effect, we might even say a symptom, which may arise from various causes; yet, as it is often spoken of as a disease *per se*, and in the present state of our knowledge, we are also sometimes compelled to recognize it as such, and as it may give rise to subsequent lesions, and those of no mean importance, it is expedient to give it a separate notice.

Jaundice, then, is to be recognized by the yellow skin and eyes, white stools, and deep saffron-coloured urine which stains the linen. The diagnosis of the disease is, therefore, almost obvious at first sight, the question being as to its cause; but even before pronouncing the disease to be jaundice, we must look carefully in the patient's face, since some persons have a sallow complexion not unlike the hue of jaundice; and the tinge in some chlorotic females is nearly of the same cast, as is also that in the remarkable discoloration to which Dr. Addison called the attention of the profession in connection with the renal capsules. A careful examination of the conjunctivæ, which are pearly in the latter affections, will soon remove all doubt. The stools, again, are not necessarily white in jaundice, as we shall presently have occasion to notice; and there may be white mucous stools without jaundice. The urine is however always dark, sometimes nearly resembling London porter, with a yellow margin, and giving a deep-green colour with nitric acid.

The jaundiced appearance, then, is produced by the presence of the bile in the serum of the blood, whence a portion of it, and at all events its colouring matter, is carried off by the kidneys, giving rise to the dark urine; whilst the pale colour of the fæces arises from the bile not finding its way into the alimentary canal.

There has long been a question as to the manner in which the bile finds its way into the circulation, and in this is involved a preliminary question, as to the origin or formation of the bile itself. The earlier opinion was that the bile was formed in the liver, and when its exit through the ducts was obstructed, it was absorbed into the system, and gave its characteristic colour to the tissues. The discovery, however, that the urine was not formed by the kidneys, but in the extreme circulation, led to the belief that the bile was so likewise. The cases are not however strictly analogous, since the bile must be regarded as not entirely excrementitious, like the urine, but also as a secretion having important uses to fulfil before it is finally expelled from the system. There can, however, be little doubt, from what we observe in jaundice, that, like the urine, the bile, or some of its ingredients, are noxious when retained in the system; and therefore the inference was not an unreasonable one that the non-*secretion* of bile might account for its presence in the blood. But although the existence of the bile or its proper ingredients in the blood, independently, does not seem, *à priori*, improbable, and would even appear to be rendered highly probable by the analogy of the urea and other ingredients of the urine; and though this probability has been received as a verity by our distinguished countryman Dr Budd, as well as by Bamberger on the continent; it may be argued, on the other hand, that all the experiments which have been instituted with a view to ascertain the pre-existence of the bile in the circulation, have not only failed to do so, but have tended to disprove it; and that in those cases in which the structure of the liver is destroyed, as in the instance of granular degeneration or cirrhosis, there are no traces of the proper constituents of the bile to be found in the circulation—although the disorganization of the organ may have been such that no bile appeared in the gall-bladder or the intestines — whereas in similar diseases of the kidneys the urea accumulates in the blood in large quantities.

Other arguments against the pre-existence of the bile which are hardly within the scope of the present work, may be found in Frerich's 'Clinical Treatise on Diseases of the Liver,' of which a translation has been published by the New Sydenham Society. In answer to this, again, it may be urged that in those cases in which there has been slow disorganization of the liver, such as cirrhosis and the fatty liver, the whole process of nutrition and the transformation of tissues must go on very languidly and imperfectly; and that more particularly is there in the blood a great defect of hæmatine, the material from which the bile pigment is probably formed; so that if the liver be in a state in which it can perform but a very small amount of function the general system is in a state in which there would be a proportionately small demand for those functions. At present, therefore, we must be content to leave the subject *sub judice*, or rather *sub judicibus*, since we may reasonably hope that as it is one to which many accomplished physiologists and chemists, and amongst them our countrymen Dr. Bence

Jones and Dr. Pavy are directing special attention, we shall soon have much more insight than we now possess into those most intricate, and to the physician most interesting questions, the functions of the liver, and the manner in which those functions are performed.

Viewing the subject, however, from our present low standing-ground, we are justified in assuming that whilst the bile is undoubtedly a secretion which has to fill an important office in digestion, it is also partly an excretion capable of acting as a poison if retained in the system, the useful and the noxious ingredients being probably distinct. The *excretion* being possibly a product of the metamorphosis of tissues, the *secretion* formed in the liver.

It has been suggested that the presence of bile in the blood, and that in some of the worst forms of jaundice, may be accounted for by the spontaneous conversion of the hæmatine, or colouring matter of the blood, into the cholepyrrhine, or colouring matter of the bile: this hypothesis is by no means an improbable one, though its truth has never been absolutely demonstrated. Frerichs, however, who is opposed to this view, himself admits the existence of jaundice in pyæemia and its allied conditions, in the narcotism of chloroform and in other intoxications, in pneumonia and marsh fever, &c., though he explains it upon the hypothesis of the "small consumption, or sparing change of the bile which has been taken up into the blood," it being, however, questionable whether in health bile is so taken up.

We are, however, justified in assuming three causes of jaundice.

1. Diminished circulation of blood in the liver, arising in some cases from disease in the chest, p. 461.
2. Obstruction to the escape of bile.
3. Obstructed metamorphormis, or diminished consumption of bile in the blood, according to the views of Frerichs, but according to those who believe in the pre-existence of bile in the blood, inquination of blood by the bile, owing to the non-elimination of that substance by the liver.

Whatever hypothesis we adopt as to mode and seat of the formation of the bile, we shall be prepared to expect when this secretion is suppressed or retained, that two classes of symptoms will ensue; first, those arising from its absence in the alimentary canal, and the physical manifestations of its presence in the system; and, secondly, those which may be ascribed to its poisonous influence when circulating in the blood.

Amongst the first class of symptoms may be reckoned the colour of the skin and conjunctivæ, the dark colour of the urine, and the absence of colour in the stools, but besides these and more important, there is impediment to the natural conversion of the food after it has passed from the stomach, and a liability to speedy decomposition and fermentation; the consequences of which are that nutrition is checked, and the patient becomes emaciated and languid, and also that the stools, besides being pale, are offensive, sourish, and apparently in a state of fermentation. Of the second class of phenomena are the stupor, delirium, coma, and other signs of cerebral derangement not uncommonly observed in jaundice; and perhaps we may add the occasional excitement of serous inflammation. Now it is a fact which must be familiar to every practitioner, that in many, or rather in the greater number of cases of jaundice, we have the first class of symptoms without any of the latter and more alarming ones, unless it be torpor or apathy, not amounting to stupor, which often attends simple jaundice; though it is not unlikely that this is to be accounted for by the impaired nutrition and consequent languid circulation through the brain.

Another effect of jaundice in all its forms is the tendency to hæmorrhage, not only from those organs which discharge their venous blood into the portal vein, but from all parts of the system, sometimes giving rise to purpura, and always rendering every solution of continuity more than ordinarily dangerous; and a no less remarkable but more frequent and characteristic symptom is the great irritability, or rather itchiness, of the skin.

The above include the essential symptoms of jaundice, the others which frequently accompany it belong more properly to the lesion of which the jaundice itself is an effect or symptom.

Jaundice, as we have seen, may be induced by mechanical venous congestion of the liver of the passive character, as well as in the more active congestion, arising probably from over-stimulation (p. 463). In the former case the jaundice probably first commences in the liver; where the bile is *re-absorbed* into the circulation, it shows itself mainly by the yellowness of the conjunctivæ, and by the colour of the urine, which is also at the same time loaded with urates and purpurine. In the jaundice from the more active form of congestion, there is, as we pointed out, a greater tendency to the more formidable symptoms of *retained* secretion.

Catarrhal inflammation of the ducts is probably the most frequent cause of simple jaundice: this jaundice may be of varying intensity, both as regards the colour of the skin and the urine, and the paleness of the stools. When there is thickened mucus obstructing the common duct, the jaundice becomes complete, and the same must occur when the ducts become obstructed from thickening or adhesion.

There is, again, another cause of jaundice from obstruction in the ducts, which deserves especial notice from the severity of the suffering which ordinarily attends it, and that is gall-stone. Gall-stones are concretions in the ducts or gall-bladder, consisting commonly of cholesterine with colouring matter of bile. These concretions are sometimes solitary, sometimes in great numbers, and may form either in the gall-bladder or in the ducts; they may be of various sizes, sometimes as large as a filbert: they often remain some time in the gall-bladder, and it may be by their escape thence that they first make themselves felt either in the cystic or the common duct, though they may be present and cause obstruction in the hepatic duct or any of its branches. The symptoms attending passage of a gall-stone are—intense pain in the region of the liver, extending to the scapula. It is sometimes of a dull aching kind, though more frequently it is acute, and appears to be the most agonizing that can be endured; it comes on in paroxysms, and is attended with vomiting of sour matter, and sometimes hiccough, with a frequent catching inspiration. The intense pain, aided it may be by irritation so near the solar plexus, brings on a state of the greatest exhaustion, either reducing the pulse below the natural frequency, or else rendering it very quick and feeble. In a case which occurred to the author, the patient appeared to have died from the depressing effect of a large gall-stone in the common duct, since the symptoms had not been of an hour's duration, and there was no jaundice, though the duct was completely obstructed. There are often rigors, sometimes recurring periodically. If the obstruction do not give way, the urine becomes high coloured, and in most cases the patient brightly jaundiced. This will not, of course, be always the case, since whilst the concretion is in the cystic duct there need be no jaundice, and if from its angular shape it only partially obstructs the common duct, the jaundice may be slight, or only transient, appearing and disappearing with great rapidity. Should the gall-stone not be expelled, the patient either dies from the depressing effect just noticed; or owing to the effect of the continued obstruction upon the tissue of the liver the secreting cells become disintegrated, giving rise to a fatal form of jaundice to be presently noticed.

The most satisfactory evidence of the cause of the jaundice is the detection of the calculus in the evacuations. If the fæces be mixed with water, it is probable that the gall-stone, which is specifically lighter, will rise to the surface. When the gall-stone has one or more flat polished faces, it has probably been in contact with several others in the gall-bladder.

Besides the obstructions within the ducts, there may be causes of pressure from without, as from malignant disease in the neighbourhood of Glisson's capsule, in the small lobes of the liver, in the pylorus, the head of the pancreas, or the duodenum. Under these circumstances the jaundice will commonly come on very gradually, and there will be emaciation, often enlarged and hardened glands, in the axillæ, groins, or elsewhere, or other signs of malignant disease. Malignant growths in the liver may produce jaundice by pressing upon the ducts, but it may as frequently happen that there is extensive disease of this kind in the liver without jaundice, the fact being that such disease is *in* the organ, not *of* it, and therefore unless the growth act mechanically, the function of the organ is not interfered with. A similar effect may be produced by hydatids in the liver itself or in neighbouring viscera; the liver being, as we have noticed, the most common habitat of these entozoa.

The most formidable variety of jaundice is, however, that which results from the yellow atrophy of the liver, to be presently described, though this may not be its only cause, since it may arise from acute cirrhosis, rapid fatty degeneration, and probably, as we have seen, p. 463, from active portal venous congestion. It is much more dangerous than the former variety of jaundice, and in the majority of cases terminates fatally. In its commencement it differs little from ordinary jaundice, and even in the subsequent progress it is not always easy to draw the distinction between the two, since extreme cases of the former may merge into the variety of which we are now speaking.

These cases are not of such common occurrence as to enable us to speak with any precision as to their modes of attack as distinguished from cases of ordinary jaundice. It may however be stated generally, that there is a longer period of malaise before the icteric tint is manifested than occurs in ordinary jaundice; there being in most cases headache, coated tongue, irregular bowels, and accelerated pulse, for about a fortnight before its appearance. When this takes place, the jaundice may exist at first in the simple form, and so continue for several days, or even a fortnight or longer, but in the majority of instances the more severe symptoms make their appearance very soon after the jaundice: may even come on contemporaneously with it. These are vomiting of a grumous liquid, and severe pains in the head. The head affection is, however, the more essential and characteristic, and mostly shows itself about the same time with the gastric ones, or even without them. Sometimes there are drowsiness and stupor; these soon pass into delirium, in most cases of a furious character, the patient being with difficulty kept in bed, and sometimes becoming perfectly maniacal. In some cases the patient is quiet, and can be made to return a pertinent answer if spoken to very loudly. The delirium is usually followed by convulsions, generally of a partial character, affecting most frequently the muscles of the neck, but in nearly all cases there is much muscular tremor. The excitement after a time subsides, and the patient passes into stupor, the pupils become dilated, and contract but feebly with light, the respiration becomes stertorous, and the patient dies comatose.

The pulse which is slow at first, slow, often below the natural standard, becomes quick, rising to 110 or 120; though, at the same time, it manifests remarkable variations in frequency: it becomes again slow towards the close.

The tongue and teeth are covered with sordes, the abdomen often, but not always, tender upon pressure, and according to Frerichs, the extent of the hepatic dulness diminishes more and more as the disease advances.

The bowels are at the first confined, and according to some observers, the stools are clay-like at first. Dr. Budd states that they are pale; Dr. Graves, on the other hand, who was one of the first to describe this disease, speaks of dark stools as an unfavourable sign, which accords with the experience of the author, as, in two cases which occurred in patients of his own, the evacuations were dark-brown, not indeed of a warm gingerbread colour, but of a dark dingy brown, not unlike the colour of the mud in the streets of London. The urine is more or less loaded with a brown colouring matter, but has not, in general, the very dark colour seen in ordinary jaundice. Indeed, according to the author's own experience, a diminution in the deep colour of the urine and darkness of the stools, occurring in the course of jaundice, and accompanied by stupor or cerebral excitement, are the most characteristic symptoms.

Dr. Bright, who was one of the first to describe the pathological anatomy of this disease, refers the change in the liver to inflammation, and states that its surface appears variegated, of a light yellow, and dark red or purple, in patches, certain portions which appear more prominent externally, proving when cut into of a softer texture, and even undergoing a process of change or disorganization. It should be remarked, that the liver is always smaller than natural. It is due to the memory of this illustrious pathologist, to observe that this description was published by him twenty-five years ago. Dr. Budd, who has subsequently thrown so much light upon the morbid anatomy of the liver, refers the change to disintegration of the hepatic cells: the small size of the liver is certainly opposed to the notion of inflammation. Considerable attention has of late been bestowed upon the subject both in this country and on the continent, and Rokitansky has described it by the name of *yellow atrophy*, and Frerichs speaks of it as *acute yellow atrophy*. The following concise but accurate account is given by Dr. Wilks:—The liver is found to have undergone a considerable change in appearance; it has shrunken in size, is soft and flabby, and is of a greenish or yellow colour, though not uniformly so, for contained within the yellow there is generally a part having a reddish hue. The ducts appear healthy, showing no obstruction, and the gall-bladder small and containing only a small amount of bile. The microscope discovers no well-formed cells, but opaque masses of tissue, of dark colour, composed of granular matter, pigment, and fat globules. It thus appears as if the texture of the organ was quickly destroyed throughout its whole substance, but as no new products are found, such a change cannot be called inflammatory.

It is not impossible that there may be several causes of this disintegration. In some instances it may be a primary lesion, and the fact of this alarming disease having been known to attack several members of the same family in rapid succession (as in some of Dr. Graves' cases) would suggest the idea of a miasmatic origin. In others, obstruction of the common duct is the cause; and we would suggest that the smaller ducts may be closed by catarrhal inflammation (as happens in capillary bronchitis), which may give rise to disorganization in the same way as when the common duct is closed.

Terminations of Jaundice.—When the disease terminates favourably, the colour does not disappear until some time after the removal of its cause. When there has been a mechanical cause of obstruction to the passage of the bile into the duodenum, its removal is announced by the almost sudden reappearance of the bile in the stools. When, on the other hand, the cause of the obstruction is one the progress of which is necessarily gradual, the jaundice, which has generally come on very gradually, subsides almost as gradually; but in either case it is to be remembered that the pigment will often remain in the epidermial layers of the skin, and also in the conjunctivæ, long after the bile has ceased to show itself in the urine and the blood, as the overlooking this might lead to the injudicious persistence in the use of remedies. When jaundice terminates fatally, it may do so in various ways. If there is mechanical obstruction to the exit of the bile, the pent-up secretion may distend the ducts, whereby the parenchyma of the organ becomes atrophied and destroyed (much in the same way in which we have seen the lung-tissue injured by dilated bronchiæ , and the circulation through this organ may become obstructed. In this case death may ensue from coma by blood poisoning: or ascites, and eventual exhaustion may ensue. It sometimes happens, too, in cases of obstruction from gall-stones, that ulcerations of the duct or gall-bladder takes place, followed by extravasation of the bile into the peritoneal cavity and consequent death from peritonitis. In the case above mentioned, the patient, an elderly man, was killed almost instantaneously by the depression caused by the partial passage of an enormous calculus through the common duct; and in another the gall-stone found its way into the intestine only to effect a lodgment in the appendix vermiformis, where it set up the fatal symptoms already described as arising from a foreign body in that situation.

The treatment of jaundice must be regulated in great measure by our knowledge of its cause; of that arising from congestion and catarrhal inflammation we have already spoken. In the case of gall-stones, we must endeavour to favour the passage of the calculus. For this purpose opiates should be combined with purgatives and antimonials provided there be not much sickness. Thus a grain of opium with a quarter of a grain of tartar-emetic may be given two or three times daily, and the draught of sulphate of magnesia with the carbonate in the interval. Warm baths and hot fomentations are valuable adjuvants. Many recommend mercury; but if it increase the secretion without removing the obstruction, it must damage the liver.

As in many cases the cause of the jaundice cannot be removed by treatment, we must direct our efforts to counteracting the injurious effects which the bile may have upon the system. With this view we must endeavour to regulate the functions of the bowels which become deranged by the stoppage of the flow of bile into them, and purify the blood from the biliary matter which has accumulated in it. We must restrict the patient to the simplest and most easily-digested food, as lean meat, vegetables, and light farinaceous articles of food, strictly prohibiting all oils and fat. The action of the bowels may be encouraged by infusion of rhubarb with compound decoction of aloes, though the saline purgatives are to be preferred in those cases where we suspect catarrhal inflammation of the ducts. A steady action of the kidneys should be kept up as the best means of eliminating the biliary matter: for this purpose the vegetable diuretics, amongst which the taraxacum is one of the most appropriate, with small doses of acetate or nitrate of potass, should be given.

There are, in addition, several remedies, or classes of remedies, which are employed empirically, some of which, if not used in any excessive quantities, are often undoubtedly of much service; amongst these the most important are purgatives; and there can be little doubt that the keeping up a steady action of the intestine, and stimulating its secreting function, is one of the safest and most effectual methods of promoting the excretion of the bile. It is only with this object that mercurials should be used: one or two grains of calomel with five of compound extract of colocynth, or a grain and a half of watery extract of aloes, may be given every night, or every alternate night, and often with good effect.

There can be little doubt that emetics promote the excretion of bile, and with this view half a drachm of ipecacuanha may be given every second day. Where, however, there is reason to apprehend gall-stones, we must be cautious in exciting vomiting, lest, if it occur violently, it may cause rupture of the duct.

Narcotics have also been recommended, and there can be little doubt that the purely sedative ones (if the phrase may be allowed), belladonna and henbane, are effectual in aiding the escape of impacted concretions. Opium is to be used cautiously, owing to the tendency to stupor which often exists in jaundice.

The muriate of ammonia has been highly recommended by many, and is probably a very appropriate saline in catarrhal jaundice.

In regard to the treatment of the dangerous form of jaundice from disorganization of the liver, steady purgation, we believe, holds out the best hope. Dr. Budd recommends the annexed formula (F. 74).* Mercury is decidedly objectionable upon the grounds just stated. When the excitement is great, cold may be applied to the scalp, and if the heat is diminished a blister may be placed upon the back of the neck.

Jaundice sometimes appears to be the result of impeded functions of the liver, from a lesion of innervation, as in the instances, not uncommon, of simple jaundice coming on after anxiety or depression of mind. In these cases the stools are white, the urine dark, and the countenance slightly jaundiced, the pulse slow, the patient languid. For this the best treatment is at first the blue pill and colocynth, with saline aperients; subsequently change of air and scene, moderate exercise, and compound decoction of aloes, with taraxacum.

In cases of torpid liver, or jaundice from chronic change, the nitro-muriatic bath (F. 75),† recommended by Sir C. R. Martin, is useful.

[*] (74) ℞ Mag. Sulph. ℥ ss.—℥ j.
Mag. Carb. gr. xv.
Sp. Ammon. arom. ℥ ss.
Aq. puræ, ℥ x.
F. Haust. ter die sumend.

[†] (75) ℞ Acidi Nitrici, ℔ i.
Acidi Hydrochlorici, ℔ ij.
Aquæ ferventis, conj. xl. Misce.

XXIV.

DISEASES OF THE KIDNEYS.

The urinary diseases which more particularly belong to the province of the physician are, in general, those in which the *secretion* of the kidneys deviates from its healthy condition, either as to quantity or quality, independently of those mechanical causes which interfere with its *excretion* from the bladder; the management of which falls more within the province of the surgeon. Now it must be borne in mind that for the secretion of healthy urine two general conditions are essential. First, there must be a healthy and normal condition of the blood from which the secretion is to be eliminated; and secondly, a healthy condition of the kidneys which are to eliminate it.

As regards the quantity of the urine, we have elsewhere explained the law (p. 27), that in order to the due supply of water (upon which the quantity of the urine depends) there must be a ready absorption from the stomach and intestines through their respective veins, a free passage through the portal vein and its branches in the liver, a free return through the venæ cavæ hepaticæ to the ascending cava and right auricle and ventricle, a free passage through the pulmonic circulation to the left auricle, a free transit through the mitral valve and left ventricle, and thence through the aorta and renal arteries to the kidneys, and through these organs; and if obstruction to the circulation exist in any part of this circuit, we shall have the quantity of urine defective: and very scanty urine means nothing more than this; it points out that there is this cause somewhere, but it does not necessarily imply that there is *mechanical* obstruction; for, on the contrary, it may arise altogether from a morbid impediment to some of those physiological actions which are essential to its transit through this course.

When there is sickness, the fluid taken into the stomach being rejected before any absorption can take place, the urine is scanty, and the same is true when there is obstruction in the course of the small intestines. If, again, there be congestion or induration of the liver, the same result will ensue, and also if the fluid pass very rapidly through the intestines, as in severe diarrhœa, and still more when, instead of absorption, there is very rapid exhalation of fluid into the stomach and small intestines, as in the case of cholera, in the severest forms of which there is absolutely no urine secreted. When, again, there is obstructive disease about the right side of the heart, or in the cava near the entrance into the right auricle, and in the still more common case of obstruction to the pulmonic circulation from disease of the bronchial tubes or lungs; or, if there be disease of the mitral valve, causing either obstruction or regurgitation, the urine will be scanty; and also when there has been disease of the aorta or its sigmoid valves of sufficiently long standing to impede the action of the left ventricle, and also when obstruction to the extreme circulation is produced by the arrest on diminution of the interaction between the blood and the tissues, as in the case of fever. We see then that the urine may be diminished in quantity from disease in any of these situations, independently of any affection of the kidneys themselves.

With the kidneys the case is somewhat different. There may be disease of these organs without any diminution in the quantity of the urine, or even with an increased flow of it. Thus, if there be a free elimination of water by the Malpighian bodies, the quantity of the urine will not be diminished, though the tubes may be diseased. In this case the change will be in the quality but not in the quantity of the urine, unless, indeed, the change in the tubes be such as to cause a mechanical impediment to the passage of the blood through them.

As regards the changes in the quality of the urine, we may divide them into two great classes. I. Those in which the deviations from the healthy condition consist—of matters belonging to it in health, but altered in quantity,—or of substances which are not integrant ingredients of healthy urine, but are products of imperfect assimilation or digestion; so that here we have two kinds of abnormal urine depending not so much upon the disease in the secreting organs as upon a morbid condition of the blood from which the secretion is to be derived; of these, as they belong rather to lesion of the organs of digestion and assimilation, we shall speak elsewhere. II. As regards the other class of morbid products in urine, those, namely, in which the integrant ingredients of the blood are present, we find that unless they proceed from lesion of the urinary passages or bladder, they are the effect either of passive hæmorrhage, or of that large and important class of diseases which, for convenience sake as much as from the want of a better term by which to express them, we include under the name of Bright's disease, after the illustrious physician to whose researches we are indebted for nearly all the knowledge we possess respecting them. In this form of abnormal urine we find two remarkable conditions, both of primary importance in the clinical history of the disease of which we are treating: (1) The presence of some of the essential ingredients of the blood; and (2) the absence or defect of the natural ingredients of the urine.

(1.) The presence of blood-matter in the urine is, when it proceeds from the kidneys, a product of diseased action in those organs, and is to be received as probable evidence of such: but that action, like similar disease in other organs, interferes with their natural and healthy functions: that is to say, in this case, with the elimination of those substances which ought to be carried out of the system by the kidneys—hence (2) the absence or defect of the natural solid contents of the urine. Some of these, the urea and uric acid more particularly, act as poisons when retained in the system, and exert their influence either directly, upon the nervous centres, or more indirectly and slowly, by producing inflammation or chronic changes in the various tissues of the body; and further than this, the very abstraction of the blood-matter by the urine is itself a direct source of mischief, producing, when long continued, a deficiency in the natural elements of the fluid which is the pabulum of the whole system.

Of the ingredients of the blood, as in the original fluid, so also in the morbid secretion, which is derived from it, the albumen is the most abundant of the soluble solid contents. The insoluble or red globules, though the most abundant in the blood, are not necessarily present in the albuminous urine, since, owing to their inability to transude through the coats of the vessels, they can only find their way into the urine by more or less laceration of some of the minuter vessels. Indeed, as a general rule, we may say that the red globules, when present in this form of morbid urine, are never so in a quantity proportionate (as compared with the blood) to the albumen, and that when present in the urine in such quantity, they indicate that the affection is more strictly of a hæmorrhagic character, probably of a traumatic origin.

As then the albumen is the chief ingredient in such exudation, it is important to be provided with a ready test for detecting its presence. Now it is well known that a simple solution of albumen in pure water is rendered milky by the application of heat above 160° F., owing to the coagulation of the albumen at this temperature; but the urine not being a simple fluid, but one which may contain substances which prevent this coagulation, such as the alkalis and alkaline carbonates, which form with it albuminates soluble in boiling water, we have need of some other test not liable to this objection. Nitric acid is such a test, as it will throw down albumen when present even in a minute quantity, and of course prevents its combining with the alkalis. But nitric acid may throw down from the urine a precipitate which is not albumen: thus if there be a large quantity of urate of ammonia present, the nitric acid combines with the latter, and separates the uric acid, which gives to the urine a turbidity that by an unpractised eye is not very readily distinguished from albumen; this, however, is re-dissolved by the further addition of nitric acid. Heat is also liable to the objection, that it may produce a precipitate, which is not albumen: this ensues when the urine contains a large quantity of phosphates: such urine is generally alkaline, but not necessarily so; this precipitate, when it occurs, is immediately re-dissolved by nitric acid. We see then that nitric acid and heat may both give precipitates which are not albumen, but that both precipitates may be re-dissolved by nitric acid if not albumen. Heat again is liable to the objection that it may give no precipitate though albumen be present: to this objection nitric acid is scarcely ever liable, though the addition of a few drops may give a precipitate, which is re-dissolved by a further addition, and this may even take place a second time if the acid be added guttatim; but the further addition of acid produces a precipitate which neither itself nor the heat can re-dissolve.

The two tests thus used in conjunction are therefore liable to little or no fallacy: the nitric acid alone is no doubt nearly sufficient for all cases; but if the urine be previously turbid by any of those substances which are re-dissolved by heat, we cannot so well judge of the effect produced by acid. This difficulty would no doubt be obviated by previously filtering the urine, which ought to be done in every doubtful case. For bedside purposes the best method is to put first a small quantity, say about three drachms, into a *clean* test-tube, and if the urine be previously clear, and no precipitate comes down with nitric acid, there is, in all probability, no albumen present; but should any appear, boil the fluid in the tube over a spirit-lamp, and if this resist the heat, we may be sure that it is albumen. Should, however, no precipitate occur upon the addition of the acid, we may be almost equally sure that there is no albumen; but as it is well to verify even this test, let some of the urine be boiled *in a clean tube*, and then add the acid; if no precipitate occurs with either test, we may be nearly confident that there is no albumen, and if heat gives one which is re-dissolved by nitric acid it is phosphatic, and if there be none by heat, but nitric acid gives one, it is albumen, if the nitric acid be freely added.

It is commonly supposed that the phosphatic precipitate takes place only in alkaline urine; this, however, is by no means universally true, as has been shown by Dr. Rees; such urine, however, generally has a less decidedly acid reaction than healthy urine, or even the majority of cases of albuminous urine. It is remarkable that the liability to the opposite fallacy, namely, the presence of albumen without its giving a precipitate by heat, is also connected with alkaline urine; and, universally, when the urine is alkaline we are not to suppose that it is not albuminous because heat gives no precipitate, or rather we should place no reliance at all upon heat under such circumstances. It is not, however, as certainly true that when the urine is acid, albumen, if present, will be thrown down by heat, since specimens of *acid* urine have been examined, though rarely, (and in carefully-cleaned tubes, too,) in which there has been no precipitate thrown down, although the heat has been continued for some time. Such urine has generally been of high specific gravity, and it is therefore probable that the albumen has been held in solution, by the ammonia resulting from the decomposition of the urea. It follows from this that heat is never to be used without first ascertaining whether the urine is acid or alkaline, an examination which ought, however, under no circumstances to be omitted.

For bedside purposes in private practice, and upon a first visit to a patient, when other tests may not be so readily procured, heat applied in the rough way of a spoon over a candle is a very convenient one, and a practised eye will generally recognize with tolerable certainty a precipitate of albumen thrown down in this way: but this should never exclude a more careful examination afterwards; and when there are other symptoms which indicate the probability of the urine being albuminous, the absence of a precipitate by this test is never to be considered as satisfactory. The fallibility of heat as a test for the presence of albumen, both positive and negative, probably accounts for the fables narrated of persons passing albuminous urine after a hearty meal of animal food, and when suffering under dyspeptic symptoms, produced by indigestible substances; such, for instance, as pastry. With regard to the latter, it must be remembered too that disordered stomach is one of the effects of renal disease, and may be present when many of the more prominent ones are wanting. Persons under the influence of mercury are also said to pass albuminous urine without there being disease of the kidney; but as far as may be inferred from a very large number of observations made at Guy's Hospital, this is also an erroneous belief, though several such patients passed urine which gave the phosphatic precipitate with heat. Pregnant females not unfrequently pass albuminous urine, the albumen, in most cases, disappearing after delivery, and the patients doing well; but, as has been pointed out by Dr. Lever, care is required in such cases, as there is a greater liability to puerperal convulsions, and other formidable nervine symptoms.

A very delicate test for albumen is the addition of a solution of ferro-cyanide of potassium after acidulating the urine with a few drops of strong acetic acid.

The methods of testing the urine for the presence of albumen have been dwelt upon at more length on account of their extreme importance, and of the presence of albumen being the surest sign of the elimination of blood-matter by the kidneys. When albumen is present, fibrine is so also, though it may escape detection: in most cases, however, it may be perceived in the urine, by the aid of the microscope, in the form of casts of the uriniferous tubes. Blood-corpuscles may or may not be present; when they are they may be detected by the microscope, and their presence in great abundance is a sign of the disease being rather of a hæmorrhagic character than the renal disease which we are now considering. Hæmatosine or hæmatoglobuline may find its way into the urine without any laceration of the vessels, by the disintegration of the corpuscles. It may be observed, however, in reference to this, that purpurine has often given to urine an appearance that has even led medical practitioners of experience to a belief that blood was present.

When pus is present in the urine, its serum will of course render the latter albuminous; the pus will, however, be detected by the appearance of the pus-corpuscles under microscopic examination, as well as by the action of liquor-potassæ applied to the sediment which subsides from the urine. Puriform urine is, however, by no means incompatible with Bright's disease.

Like the other organs of the body, the kidneys are liable to congestion, as well as to acute and chronic inflammation.

Congestion.—Of this we know but little in its simple form, except that it is liable to arise where there has been impediment to the return of the blood through the ascending cava produced by disease of the lungs, heart, or liver, or by obstruction either arising from disease within the vessel itself, or produced by pressure from without, as from tumours or enlargement of neighbouring viscera. The kidney becomes large and dark, and somewhat coarse; it is, however, denser in its structure, than in the more active hyperæmia, to be presently described as constituting one or the forms of Bright's disease. The urine in this form of disease is almost always scanty, generally of high specific gravity, and loaded with urates containing a small quantity of albumen. When rendered turbid by urates, it is generally cleared by the first application of heat, but its continuance renders the fluid again turbid by the coagulation of the albumen. It is probable that the engorgement of the kidney is not uncommon, as a secondary affection in disease causing obstruction to the circulation through the chest, as is the case with pneumonia; and the same thing may arise in the course of diseases attended with obstruction to the systemic circulation, as is the case with typhus, in which perhaps the tendency to passive congestion of the kidney is aggravated by the patient lying long on his back. This affection of the kidney is closely analogous to the nutmeg liver, or hepatic venous congestion of that organ.

The urine in this affection of the kidney is scanty, generally of high specific gravity, loaded with urates, and contains but a small quantity of albumen. This engorgement of the kidney will often subside if the primary disease from which it has arisen can be removed. The passive or mechanical congestion of the kidney rarely if ever becomes an immediate object of treatment; it is, however, of some importance to be aware of the circumstances under which it is apt to occur, as otherwise the detection of albumen in the urine, under these circumstances, might induce a belief in the existence of some of the more severe forms of Bright's disease, and possibly warp our diagnosis, and tie our hands in regard to remedial measures,

By *nephritis* we mean an acute inflammation of the kidney, which may be either idiopathic, or it may be the effect of some mechanical cause, as the presence of a calculus, or of some poison taken into the stomach, and thence absorbed into the circulation; of this we have instances in the effect of very powerful diuretics, and also of acute poisoning by lead; tubercles, or the presence of strumous, or sometimes of fibrinous deposits, may also be either the causes or predisponents of inflammations.

In the idiopathic inflammation, the kidney is generally somewhat enlarged, of a deep dusky red or chocolate colour throughout, and when handled softer and more lacerable than natural: in severe and fatal cases of this kind we often find minute points of suppuration through the organ, and puriform mucus oozing from the points of the infundibula. This inflammation may possibly terminate by resolution, in which case the symptoms subside, though in a large proportion of cases it proves fatal in its acute or earlier stage; or, it may lead to suppuration, one or more abscesses being formed in the organ, or sometimes the kidney is reduced to a mere sac of puriform matter. Acute nephritis may also pass into a chronic state, constituting one of the forms of Bright's disease.

The diagnosis of nephritis is not without its difficulties, and the same remark applies to other forms of renal irritation. Gastritis has many symptoms of nephritis; indeed sickness belongs as much to the latter as the former, and in both is the urine remarkably scanty; but besides the infrequency of pure gastritis, the urine when passed, though concentrated, is otherwise healthy, and contains no blood-matter; whereas, in nephritis what little is excreted almost always contains albumen and fibrinous casts. With regard to another affection however, namely, obstruction in the duodenum or upper part of the small intestines, the distinction is still more difficult, since, as in that case we may have no urine at all for three or four days, we can get no evidence from that source: this long-continued suppression should, however, incline us to look for its source rather in the intestines than in the kidneys. In this case, as also in that of the stomach, we must direct our attention to the seat and character of the pain. Its lancinating character, its extension along the course of the ureters and down the thigh, or the numbness in the latter situation, together with retraction of the testicle, all indicate nephritic affection; but, on the other hand, these may be wanting, and it is not impossible that in occlusion of the duodenum, there may be spasms and cramps which may simulate the pain in the thigh and be attended with retraction of the testicle: this difficulty, it is true, is not a common one, but speaking from personal experience, it has occurred in several instances, and it has been a great difficulty when it has done so, though it does not seem to have attracted the attention of authors generally; it is, however, more readily solved, when the connection between intestinal obstruction and scanty urine is remembered and understood. When there is urgent sickness from kidney irritation, the abdomen is generally moderately tumid: in the urgent sickness and scanty urine of intestinal obstruction, that obstruction being high up in the canal, the abdomen is necessarily flat.

In colic the pain will often be apparently in the region of the kidneys or ureters, or both; but in that disease, owing to the obstruction being low in the bowels, the urine is abundant. This will prove that the disease is not nephritis, though it will not prove that the pains do not proceed from the presence of a calculus: but to that we shall presently revert. In connection with the diagnosis of this disease, we may mention, that the testicle may not only be retracted and painful, but that it may also be actually inflamed; this fact, pointed out by Dr. Watson, in connection with nephritis, though it may not often afford much aid to our diagnosis, is most interesting as an instance of inflammation arising from irritation at one extremity of a nerve causing irritation or inflammation at other extremities of the same, or communicating nerves: in other words, it is evidence of the *reality* of nervine inflammation.

We have just been alluding to the irritation arising from a calculus, and this may often be attended with nephritis; indeed it is, perhaps, the most frequent cause of the acute form of that disease: but these pains may arise without inflammation, or with inflammation confined to one kidney only; in the former case the disease is described as *nephralgia*, (some practitioners indeed speak of nephralgia as an independent disease). In nephralgia the local symptoms are the same as in nephritis, but there is no fever; there will, however, be sickness, and the urine may be abundant, or even excessive: it is here then, perhaps, that the greatest difficulty will arise in distinguishing this disease from colic; but the lower bowels are not obstinately constipated, and the examination of the urine will, in the case of a uric-acid calculus, soon settle the question. In the case of an oxalate-of-lime calculus, the obscurity is greater, and can be decided only by a careful microscopic examination of the urine. Still it would be possible to multiply cases in which there has existed the greatest difficulty in distinguishing between diseases of the colon and irritation of the ureter, and the diagnosis is one that can be made only by minute investigation of each individual case, and of which it is impossible to include the whole details under any general rules. There is sometimes difficulty in distinguishing disease of the kidneys, whether nephritis or neuralgia, from that of the spinal column or the contents of the spinal canal. It is true, indeed, that both are often implicated at the same time, especially in the cases of suppurative disease of the kidney, described by Mr. Stanley; but in these cases the active nephritic symptoms are not generally present, and when the vertebræ are diseased, examination of the spinous processes will almost always detect either tenderness or luxation. The most valuable diagnostic sign in such cases is sickness: when the pain proceeds from irritation of the kidney, it will rarely be wanting.

The treatment of nephritis is in principle the same as that of all inflammations. We must endeavour to reduce the inflammatory action by such general antiphlogistic measures as the strength of the patient will tolerate; next we must use all means to exclude every cause of fresh excitement of the inflamed organ, and in very severe cases, and where the pulse and general condition of the patient warrant it, blood may be drawn from the arm. In the majority of cases, however, cupping from the loins is to be preferred, the quantity being of course regulated by the age and general condition of the patient. Even where the powers are feeble we may take two or four ounces, partly as a revulsive. As regards internal remedies we are somewhat at a loss, owing to the frequency of sickness. Calomel in small doses, in combination with opium, also in small doses, will sometimes obviate this, but large quantities of mercury are uncalled for; and it is very probable that were we to bring the system under its influence we should promote organic change in the kidneys. Opium also must be used with care, both on account of its tendency at first to confine the bowels; and the danger of its affecting the brain, already threatened by a narcotic poison. Diuretics, though sometimes supposed to be indicated by the diminished secretion of urine, are the most mischievous drugs that can be employed in acute nephritis. Antimony appears to be indicated as promoting the action of the skin, and thereby determining *from* the kidneys, instead of *to* them, like diuretics. The objection to its use is the tendency of sickness; it will not, however, be generally found that minute doses of antimonial medicines will aggravate sickness (they may indeed stop it), and the following pill will generally be admissible (F. 76)[*] Or should the opium be contra-indicated by tendency to stupor or other form of cerebral affection, or should the tartar emetic appear to increase the sickness, we may use a combination of henbane with *true* James's powder (F. 77).[†] Saline medicines, which do not act principally upon the kidneys, such as Liq. ammon. acet. and Liq. ammon. citrat., may be employed in small doses, and the action of the skin encouraged by large poultices to the loins, and by vapour-baths. If sickness be urgent, a few grains of calcined magnesia may be given in water. The diet should also be strictly antiphlogistic, the aliment consisting mainly or entirely of farinaceous substances; animal broths being not only too stimulating to the system generally, but objectionable as solutions of azotised matter: the kidneys being the natural outlet for such substances which are therefore in some degree stimulants to those organs. Milk is not liable to the latter objection, which is however applicable to tea and coffee. It is needless to insist upon the necessity for perfect rest in acute nephritis, as the patient is generally far too ill to wish to do otherwise than keep his bed; still it is a principle to be remembered in the treatment of the less acute stages, and also as bearing upon the management of kidney disease in general.

In those cases in which there is no fever, or which are in fact nephralgia from the presence of calculous matter, opium may be freely used; and in such instances there will be less danger from its effect upon the brain as the urine is commonly abundant, one kidney only being, in the majority of cases, implicated, the other is, for the time at least, sufficient for the purposes of depuration. Under such circumstances, too, gentle diuretics may be sometimes used with a view of aiding the expulsion of the calculus from the pelvis of the kidney. For this purpose the citrate of ammonia with the potassio-tartrate of soda, in doses of about a scruple, with tincture of hyoscyamus,—warm baths—and poultice to the loins, will give relief, as will also belladonna liniment or a belladonna plaster.

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[*] (76). ℞ Hydrarg. Chlorid. gr. ii.
Opii, gr. i.
Antim. Pot. Tart. gr. ss.
Fnt. Pil. vj. sumat j. $4^{\text{tâ}}$ vel 3^{tia} quaq. hora.

[†] (77) ℞ Pulv. Jacobi veri, gr. iv.
Ext. Hyoscyam. gr. v.
Fnt. Pil. ij.

BRIGHT'S DISEASE.

We now proceed to the consideration of that class of disorders far more common than the acute nephritis, and which produces a very large proportion of the deaths arising from chronic disease; for if all the cases of lesion of the heart and brain, originating in albuminuria, be taken fairly into the account, it will be found that Bright's disease is second only to phthisis in the number of lives which it destroys.

The question, however, may fairly be asked, and it is one not very easily answered—What is Bright's disease? If we inquire into the notion generally entertained by medical men, we shall find that it includes the presence of albumen in the urine, and the absence or defect in that secretion of its normal solid contents, the effect upon the blood being the destruction of its nutritive elements, and its inquination with excrementitious matters, which ought to have been eliminated by the kidneys,—the cause of these disturbances being disease of those organs. This, perhaps, was the leading idea in the mind of Bright himself throughout nearly the whole of his investigations upon the subject; so that the term Bright's disease becomes almost as comprehensive as disease of the kidneys. In order, then, to give a more definite answer to the question proposed above, as well as to give an intelligible description of the different forms of the affection, and one available for practical purposes, it may not be amiss to revert, as Dr. Wilks has done, to the time when Bright commenced his discoveries, and we shall perceive that he soon found that there were two very opposite classes of cases; thus one class had albuminous urine and general dropsy, and commonly died from the effect of effusion in the head, chest, abdomen, or general areolar tissue; whereas the other presented at the commencement very well-marked symptoms, had but little albumen in the urine, had little anasarca, and generally died from chronic disease in the heart, lungs, blood-vessels, or brain, or from the direct effect of blood poison upon the nervous system. In the former class of cases the disease was more or less recent; in the latter it was essentially chronic; in the former the general affection seemed to be brought about by defect in the solid contents of the blood; in the latter it was referable to the presence of a poison in that fluid: and upon further investigation it appeared that these different forms of general disorder were associated with changes as different in the kidneys.

I. The first, or acute form of Bright s disease, may be divided into two varieties, and presents itself in what is known as acute, or, according to Blackall, inflammatory dropsy.

(1.) Should a patient so affected die early, the kidney is found in a condition which presents a close resemblance to an acute catarrhal affection; it is, in fact, if the expression may be used, a broncho-pneumonia of the kidneys. They are large, swollen in fact, and dark from an increased quantity of blood, the tubes being in a condition of active hyperæmia, closely resembling that produced by the passive or mechanical congestion described above: the surface is highly injected, and a section exudes drops of blood. According to Dr. Wilks,* "the microscope shows the tubes to have an opaque appearance, from being filled with lymph corpuscles and granular matter. Some, too, having lost their epithelium, are filled with a simple lymph, which, if removed, forms fibrinous casts. In some cases, though this is generally at a rather later period, the conical portions still remaining of a dark colour, the cortical structure has become pale, softer than natural; the surface not smooth when cut, and giving out a turbid fluid when squeezed; in such a case many tubes are found denuded of epithelium and filled with masses of secretion taking on the form of the tubules." In the commencement the urine is of a smoky appearance, as if soot had been stirred in it. It is of a specific gravity varying but little from the natural standard. It is highly albuminous, containing also red corpuscles, to which its peculiar colour is owing. Epithelial cells are also seen under the microscope in considerable quantities, whence this form of the disease received the name of acute desquamative nephritis from Dr. George Johnson, to whose investigations we are indebted not only for this observation, but also for the first successful attempt to connect the various modifications of the urine observed in Bright s disease with the different forms and stages of the changes in the kidneys.

(2.) It generally happens that the patient survives till the tubules become quite blocked up, and the whole organ much enlarged by the adventitious matter collected within it: it is then of a white colour, and presents the form of structural change described by Bright as the large white kidney. At this period of the disease the urine is very scanty in quantity, and whilst it contains the abnormal ingredients observed in the former stage, it is much more defective in the natural solid contents, and on that account of very light specific gravity. Casts of the tubules are found in abundance in the urine, and it is probable that at this stage of the acute form of Bright's disease they present themselves in the shape of transparent casts composed of pure lymph.

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* Lectures on Pathological Anatomy, p. 861.

II. The chronic form of Bright's disease is essentially a degeneration, in which there is a wasting and strangulation of the tubules and an atrophy of the entire kidney, so that it becomes reduced to less than half its normal weight, a section placed under the microscope shows the tubules lying side by side, of very irregular size and shape, and denuded of epithelium, and between them may be seen a fibrous tissue, supposed by some to be a deposit in the matrix of the organ. It is, however, questionable whether the kidney has really a matrix; and some of the best observers have asserted that they have found only a little granular matter between the tubules and blood-vessels, so that it is not improbable that the fibrous tissue observed between the tubules is a new formation; and hence it is to be inferred that the disease (unlike the acute forms) is one not merely of the tubules, but of the whole organ; the important fact for practical purposes being, that the kidney has dwindled into a mass of inactive fibrous or membranous tissue. They are in this form of disease, according to what has been stated, very small; their surface is uneven and puckered, and their tissues adherent. The tubules, as well as some of the Malpighian bodies, are filled with granules. The urine secreted by kidneys in this advanced form of disease is generally slightly albuminous, of low specific gravity, and under the microscope exhibits a few granular casts of thin tubules.

We have in the above account purposely reduced the divisions of the varieties of Bright's disease of the kidney into two principal forms, the acute and chronic; the former of which admits of two subdivisions, into the earlier and the more advanced stage of the affection; the latter being essentially a chronic degeneration from the commencement, and not, as used to be supposed, a more advanced stage of the former form. It is true, indeed, that cases in which the kidneys have ultimately been found in the extreme degree of granular degeneration have often presented at times, during life, symptoms of the more acute affection; but it is to be regarded as an intercurrent inflammatory affection, analogous to intercurrent pneumonia during the progress of phthisis, rather than as a necessary step in the progress of the disease. We also transferred the congestive form of the disease, the 'coarse kidney' to the congestive affections, not from overlooking the fact that long-continued mechanical congestion of the kidneys may lead to an organic affection of those organs, and not uncommonly does so, but because in its commencement, and as long as it ramains purely congestive, the disorder under which the patient is labouring belongs more to general venous obstruction from disease of the heart, and lungs, and liver, and must be treated accordingly. The term 'mottled kidney' has also been discarded as applied to a separate class of 'Bright's kidney,' since it is now so commonly included in the 'large white kidney' that the two expressions may be regarded as convertible terms.

We cannot quit the subject of Bright's kidney without some allusion to the fatty degeneration of the organ, to which for some time much importance was attached, it being supposed to constitute the primary and efficient cause of large numbers of cases. Further observation has, however, tended to show that fatty change is rather an effect, and a sign of previous disease, than any way concerned in the etiology of the disease itself: thus, for instance, we have seen that one of the sequels of inflammatory action may be fatty change, and accordingly the inflammatory exudation into the tubes, in the large white kidney, may eventually become fatty; and in a similar manner, the small, granular kidney may be very fatty, though both these conditions may occur without any fatty deposit whatever.

Such, then, are the general characters of the morbid changes, which constitute the fundamental lesion, in the large class of diseases which, for convenience' sake, we term Bright's disease: and such being the differences in the immediate effects of that disease (by which we mean the different modes in which the urine is altered from the normal state), which effects become in their turn the potential causes of other diseases, we naturally expect that those other diseases must be of very different characters; and further, since the alteration in the quality of the urine is of such a nature as materially to influence that of the blood itself, we are also led to expect that these secondary or remoter diseases may attack the system wherever the blood is distributed, or, in other words, that any part of the body may become affected.

Of the changes in the blood itself, the first, and most obvious, is the diminution in the solid ingredients—albumen and red globules, and after a time the fibrine also. In the first form of disease, in which the urine contains a large quantity of albumen, there is soon a notable deficiency of that substance in the blood, which has the effect of reducing the specific gravity of the latter much below the natural standard, sometimes as low as 1020 or 1015. When, as is often the case, the red corpuscles are likewise present in the urine, they also speedily become defective in the blood; but in many instances, of the second form more particularly, in which the urine is highly albuminous, it contains no red corpuscles, and in these there is no notable deficiency of red corpuscles in the blood until the disease has existed for a considerable time, after which the corpuscles as well as the albumen become defective. The same thing nearly is the case with the fibrine, which is not defective in quantity, but on the contrary is sometimes in excess at the commencement of the disease, and continues to be so even after a notable decrease in the albumen and red corpuscles; it is owing no doubt to this, that the blood when drawn is often buffed, and sometimes cupped; later, however, in the progress of the disease, the fibrine also becomes defective, falling as low as 2 or 1½ per mille. The other effect upon the blood, which may be regarded as a potential cause of disease, is the retention in the blood of the excretory matters, urea, uric acid, &c. Owing to their non-elimination by the kidneys, these substances, more particularly the urea, from its greater abundance, may be readily detected in the blood; and so retained they act as poisons, or irritants upon the nervous system, the serous membranes, the coats of the arteries, and other tissues. The principal changes thus produced upon the blood may be summed up as a deficiency of albumen, red corpuscles, and, ultimately, of fibrine also, or, which amounts to nearly the same thing, a proportionate excess of water, and the presence of a large quantity of excretory matter.

As a result of the change in the blood, we may first notice DROPSY. This indeed was the symptom, or, as it was then considered, primary disease, which drew attention to the abnormal changes in the urine of which we have been speaking, and to their subsequent connection with disease of the kidney. This dropsy shows itself in the greatest degree in those cases in which the urine is most albuminous, and the blood most abundant in water; and it is, no doubt, mainly owing to this cause; but, as serous effusion may be excited by irritation either of the general areolar tissue of the body, or of the closed sacs, we can readily believe that the presence of an irritating matter will produce the same effect. We have, therefore, two causes at work, which may be considered to co-operate in producing the effusion. This effusion is in greatest abundance in those cases in which there is the greatest drain from the blood, that is to say, in the first form of the disease, and in such cases it shows itself mostly in the form of general anasarca, though this may be accompanied by effusion into the serous cavities of the head, chest, or abdomen. It is, perhaps, in the more advanced stage of the second variety of the first form of the disease, that, namely, of the large white kidney, in which we have a coincidence of the two causes,—a great drain of blood-matter—and a very defective elimination of urine-matter,—that we meet with the greatest amount of effusion, both general and into the serous cavities; the latter kind of effusion being often of a highly-inflammatory character, and containing a considerable quantity of fibrinous or molecular lymph. In the second form of the disease, in which there may be little or no albumen passing off by the urine, we often have no dropsy, or scarcely any, though there may be sudden effusion of an inflammatory character, from the effect of the retained excretory matter in the blood. This, however, belongs more properly to the serous inflammations, to be presently noticed.

Before quitting the subject of dropsy, we may notice its tendency to affect the sub-mucous areolar tissue throughout the body; this effusion may, no doubt, like those last mentioned, be sometimes of an inflammatory character, and where we have two causes in operation, the one leading to dropsical effusion and the other exciting a degree of inflammation which may also induce similar exudation, it is difficult to draw the line: but it may be of practical utility to bear in mind, both—that those effusions which occur in such abundance in this disease, and which we are prone to regard as mere exudations, may partake in some measure of the inflammatory character,—and also, that others which from their situation, as well as other phenomena attending them, may suggest to our minds the notion of inflammatory affections, may, in reality, have much of the character of passive effusion. We particularly allude to the bronchial membrane, a sub-mucous effusion affecting which may, and often does produce, in connection with diseased kidney, sibilant and other ronchi, which we are very prone to associate with more active bronchitis. Another form of sub-mucous effusion, which is very common in all its varieties of this disease, is underneath the conjunctiva, producing the appearance of a watery eye; but when more closely regarded, it will be found that the appearance is not produced, as it seems to be, by a tear resting on the eyelid, but by an accumulation of fluid beneath the epithelium, which, gravitating towards the lower lid, causes the conjunctiva to overlap it, producing a kind of watery chemosis. This effusion is one of the most characteristic signs of renal disease, and has several times been observed in cases in which no other dropsical effusion whatever was to be detected, especially in those cases of the chronic form of the disease, in which there is a tendency to cerebral complication. Whether this may have anything to do with disturbance of the cerebral circulation, or impending effusion, may be worth investigating.

Another characteristic of the dropsy from diseased kidney is, that when it assumes the form of general anasarca, it always affects the genitals, being particularly noticeable in the penis and scrotum; it also differs from the dropsy produced by disease in the liver, in its not being confined, even at the commencement, to the lower extremities, but affecting also the upper, as well as the face, where it particularly shows itself beneath the eyes. Purely renal anasarca differs from the purely cardiac in the absence of the lividity, and other signs of congestion, which almost always accompany the latter, but in practice these causes of dropsy often concur.

We have just spoken of the effusion under the mucous membranes as a form of dropsy; but we must add, that inflammations of these membranes are among the consequences of Bright's kidney; these we meet with in every form of the disease, though perhaps more particularly in the more advanced stages. Mucous inflammation shows itself in the form of bronchitis, which is a very common effect of Bright's kidney. Dr. Wilks, in the paper above quoted, states it as his belief, founded upon most extensive observation, that it is the most common next to albuminous urine.

Another shape in which mucous inflammation or irritation presents itself in Bright's kidney is in that of the gastro-intestinal mucous membrane, in the form of vomiting and diarrhœa, generally of a dysenteric character. The connection between inflammation of the kidneys and vomiting we have already pointed out; but independently of this, there appears to be an effort at a vicarious elimination of the retained secretion by this membrane.

Inflammation of serous membranes has been already alluded to, and it was one of the effects of Bright's kidney which first attracted attention. It is very probable that the two conditions of the blood, namely, the defect in the quantity of red corpuscles and the presence of excretory matter, concur in inducing this kind of inflammation, the former by causing a susceptibility of such inflammations, as we have seen (p. 57), and the latter by acting as a direct or efficient cause. That the presence of the urea in the blood is an efficient cause is evident from the fact, that urea is capable of exciting such inflammation: and that it is present in the effusions which take place into the serous cavities in this disease is well ascertained, it having been in different instances detected in every one of them. These inflammations are often of the most sudden and violent character,—an attack of pleuritis or pericarditis sometimes proving fatal in the course of twenty-four hours. The pleura and pericardium are the serous membranes most liable to become affected in this manner; and next in order are the arachnoid and peritoneum, the former perhaps the most frequently. It is true that affections of the encephalon frequently occur, but they depend probably upon another condition of the brain to be presently noticed.

Another common consequence of the Bright's kidney is disease of the heart and large vessels. The excretory matters present in the blood appear to act as stimulants, inducing an inflammatory action in the endocardium and lining of the arteries, the consequence of which is thickening and puckering of the valves, and contraction of the orifices; the valves and endocardium on the left side being mainly affected. As an effect of this endocardial affection, either direct or through the narrowing of the orifices, that of the aorta especially, we find the left ventricle to become dilated, and, most commonly, at the same time hypertrophic, upon the principles already explained (p. 350). The chronic changes in the valves may also give rise, as in other forms of endocarditis, to obstruction or regurgitation, with their effects upon the circulation. The action of the blood upon the lining of the arteries is of an analogous character, the membrane becoming opaque, and the other coats of the artery thickened and contracted, the effect of which is to cause irregularities in the circulation, especially in the cerebral arteries, which are particularly liable to these changes; thus either apoplexy may ensue from extravasation, or from sudden arrest of the circulation; or the circulation being only partially impeded, we have the more gradual effect of softening from imperfect nutrition.

The substance of the lungs is not so frequently the subject of inflammation in Bright's disease as are the pleuræ and bronchial tubes. Still, in a considerable number of cases we find hepatization and induration of the lungs, not to mention that the state which we commonly describe as œdema is often the effect of inflammatory action, the greater quantity of fluid in the blood inducing this form of effusion, rather than that of plastic matter. The coincidence of pneumonia with albuminuria has been sufficiently common to suggest that it may be the cause of the latter; but the more advanced condition of the renal disease in all fatal cases of this kind, seems to answer the question in the negative.

Besides the affections of the brain arising from the changes in the arteries, we have cerebral symptoms produced by the direct poisonous action of the retained secretion upon the nervous matter: this is, in fact, the most sudden as well as one of the most dangerous consequences of the toxæmic condition, which plays so conspicuous a part in the phenomena of this disease. These affections are, either sudden convulsion, passing not unfrequently into coma, with a remarkable stridulous breathing; or, which is a very characteristic form of cerebral affection, we have a state of "quiet stupor," to use the words of Dr. Addison, which may continue for a considerable time, out of which the patient may recover if the elimination of the poison can be established; but if this do not take place, the stupor gradually assumes the form of most profound coma. These affections of the nervous system belong entirely, if we may so speak, to the aneccritic element of the disease; as shown by their presenting themselves in other affections in which the uræmia is induced by retained secretion, as in retention of urine, and it may be in cholera, but in which there is no elimination of urine-matter by the urine. This state also appears to be a form of narcotism, resembling in many respects those induced by opium and by alcohol. The pupil is sometimes obedient to light, never dilated, and in many instances contracted.

Another nervine affection often met with in Bright's disease is the occurrence of cramp in the limbs, especially in the lower extremities: the etiology of this affection is somewhat obscure, though its frequent occurrence is undoubted. It seems to take place most frequently in the earlier stages, so much so, that in many cases of some standing, the period of the commencement of the disease may be inferred from this symptom: it may possibly depend upon the great diminution in the quantity of the urine and consequent uræmia, which often marks the commencement or more acute stage of the disease. It is somewhat remarkable that this is a prominent symptom in cholera, in which likewise uræmia exists in a remarkable degree.

Having detailed the principal elements, so to speak, which make up this remarkable disease, we are in a position to treat of it as a whole.

In cases of the first variety we have generally a history of exposure to the cold, or of an attack of scarlatina; and about a fortnight afterwards, there are observed chills, heats, thirst, a dry skin, and almost simultaneously with these, puffiness of the face, or œdema of the feet and ankles. About the same time the urine is observed to be very scanty, and often dark, though there may be frequent calls to void it. Upon examination the secretion is found to be such as has been described as belonging to this first form of the disease. The œdema in many cases rapidly extends, so that the whole of the surface of the body becomes highly anasarcous: and this anasarca commonly extends to other parts, so that we may have œdema of the lungs or epiglottis. There is also a great tendency to effusion into the serous cavities, especially the peritoneal, so that it is rare to find a case which has gone to this extent without some amount of ascites. It is often when the disease has just attained this point, that we first see our patients, when we find them largely œdematous, the cheeks and eyelids much swollen, the conjunctiva overlapping the lower lid, the skin hot and dry, and the pulse sharp; if the disease do not subside or yield to treatment, the urine may become more abundant, but retain the same proportion of albumen; the countenance will become more bloated and doughy, the prolabia paler, the patient more unwieldy and distressed, and considerable dyspnœa will now be experienced; the pulse at this period is generally moderately full and sharp, though not very difficult of compression. If the disease still continue to advance, the œdema may extend from the areolar tissue at the root of the lungs to the lungs themselves, and become such as to cause death from apnœa; or the rima glottidis may become œdematous to such a degree as entirely to close the chink; or sudden effusion may take place in the chest or pericardium, by which life may be endangered; and the same thing may occur, though perhaps but rarely, on the surface of the brain, or into its cavities; or there may be effusion into the air-cells, or the bronchial tubes become so swollen as to produce the ill effects of œdema of the substance of the lungs themselves. Death from direct uræmic poisoning in this form is rare—that is to say, from its direct influences upon the nervous substance; but there may be sufficient uræmia to produce serous inflammations which may be fatal. Still it is not saying too much to assert that when death takes place in the acute form of Bright's disease, it is more often from the effects of the effusion than from uræmic poisoning.

It more commonly happens that the disease comes under our notice in the more advanced stage, or, if the paradox may be allowed, in the chronic stage of the acute form; thus there may have been an acute attack of renal anasarca, from which the patient has apparently though imperfectly recovered: or the disease may have crept on insidiously, in which case there will have been scarce any symptoms by which to fix the date of its commencement. Sometimes there will be increased frequency of micturition, and the urine may be absolutely increased in quantity; often too it is of the smoky appearance, though there may be no deviation from the natural colour. At others, there will be pain in the loins and across the epigastrium, or there may be cramps in the lower extremities, especially at night. The next symptom will generally be œdema, commencing at the legs or ankles, but soon affecting the face, and often producing the appearance of the conjunctiva already noticed, the countenance becoming, all this time, more and more bloated and anæmic. The œdema may now extend rapidly; and the swollen bloated aspect of the patient, which when once seen cannot be readily mistaken, is highly characteristic of this form of the disease. It cannot perhaps be better described than in the words of a sailor, who was the subject of it in Guy's, and who said he was completely "water-logged." At this stage œdema of the lungs or epiglottis, or effusion into any of the serous cavities, may suddenly take place; we may also at any time have active inflammation of the serous or bronchial membranes, or irritability of the stomach, or dysenteric diarrhœa may supervene. It is perhaps in this form of Bright's disease that we most frequently have to encounter the active serous inflammation of uræmia, which is apt to prove fatal, more particularly if it affect the pericardium; we may, too, have the sudden invasion of cerebral symptoms, from the direct effect of uræmic poisoning upon the brain; or we may have disease of the heart and arteries from inflammation of the lining membrane, producing thickening and rigidity of the arteries generally, (which may often be felt most distinctly at the wrist,)—and in the brain, softening from defective nutrition, and extravasation; the obstruction of the circulation also induces hypertrophy or dilatation, or both, of the left ventricle of the heart.

In the most chronic form of the disease, which is generally that in which we find the hard granular kidney, the symptoms are even more insidious; there may be no dropsy of any kind, though in most instances there is œdema of the feet and ankles, and slight puffiness under the eyes; in this form of the disease we may have the œdema beneath the conjunctiva producing the watery chemosis already described, even when there is no other dropsical swelling to be detected. This state of things may go on for a length of time, the patient not making much complaint or suspecting the presence of serious illness; until either from some accidental cause, inflammation within the chest, generally of the bronchial membranes, leads him to seek advice, when the true nature of his illness is detected; or what is even more common, the chronic change of the endocardium and arteries above described having been insidiously going on, he becomes the subject of palpitation and dyspnœa from disease of the aorta or large arteries, when a careful inquiry leads to examination of the urine, which may, however, be found to contain little or no albumen, but it will almost always be of light specific gravity, or if not so, absolutely, it will be so, in proportion to the small quantity excreted, thus evidencing the scanty elimination of its normal solid ingredients. When there is albumen, however, and generally there is some, there will almost always be *granular* casts of the tubules. In other cases, again, the first evidence of disease may be the invasion of cerebral symptoms, either suddenly in the form of apoplexy, from extravasation, or by the arrest of circulation, from universal thickening and rigidity of the cerebral arteries; or we may have the sudden stupor or other cerebral disturbances pointed out by Dr. Addison as the direct effect of the retained secretion upon the nervous matter. ('Guy's Hospital Reports,' vol. iv. p. i.)

In this class of cases the chief cause of the symptoms is the retained secretion acting as an irritant or narcotic poison upon the organs of circulation, upon the serous and mucous membranes, or upon the nervous centres; it seems too, at times, to act upon the extreme circulation, producing a degree of collapse with lividity, not very dissimilar in kind from cholera. This form of diseased kidney is often associated with the rheumatic or gouty diathesis, and may probably be the effect of a chronic gouty inflammation of the organ.

The diagnosis of Bright's kidney was for many years considered to be exceedingly simple; the presence of albumen in the urine, if there were no hæmorrhage to account for it, being considered a sufficient sign of its existence, and its absence a certain proof of its non-existence: the discovery, however, by more extended clinical experience, that albumen may not be found in the urine, however carefully tested, though the kidneys may be almost destroyed, as regards the performance of their most important offices, has shown that we must look to other conditions either of the urine or of the system generally, to guide us. In the acute forms of disease we have less difficulty, as the urine is in them always albuminous; and as in those cases the inflammation is mainly in the tubes, constituting a state of things analogous to bronchitis of the lung, we have generally a desquamation of renal cells, which may be recognized under the microscope; and their presence has been regarded by Dr. G. Johnson as diagnostic of these forms of the disease. The abundance of albumen, and the extent of dropsical effusion indeed, constitute more appreciable signs of this form of the disease. The latter of these may, however, for a time nearly disappear, and the former is liable to great variations; the value, therefore, of the sign pointed out by Dr. Johnson is on that account the greater.

In the hard granular kidney there is more difficulty, as the urine may be free from albumen throughout; though even here, if it be repeatedly tested, a slight deposit of it may in most cases be at some time obtained; added to which, the secretion will be either very scanty or of exceedingly light specific gravity, and with but little urinous odour when boiled or treated with nitric acid, showing the exceedingly scanty elimination of urea.

In regard to the diagnosis of the different forms and stages of Bright's disease, it becomes, as Dr. Wilks has observed, a matter of great importance to ascertain what conditions of the kidney are implied by certain microscopic appearances in the urine during life. This, however, is as yet by no means accurately determined. It may not, however, be venturing too far to express a belief that we find the casts of renal cells, and lymph corpuscles, and blood agglutinated by albuminous matter in the earlier stage of the acute form, that the transparent fibrinous casts belong to its second stage of the large white kidney, and that the granular casts are characteristic of the chronic form or granular kidney.

The causes of Bright's disease in the acuter forms are either exposure to cold, especially when the skin is in a state of perspiration, and scarlatina; it may also be induced by the injudicious use of substances having a powerful diuretic action. The second or more chronic form of the disease, no doubt, is sometimes a consequence of the first, but it appears often to have crept on gradually without any acute stage, and to have been caused, as far as we can judge, by the more gradual operation of causes similar to those which produce the first, more frequently repeated, though applied in less intensity. Amongst the stimulating causes by which this affection of the kidney may be induced, we may reckon the use of ardent spirits, more particularly gin; but it is probable that, however prolific of disease in other ways, its direct agency, as a cause of renal disease, has been much over-estimated; but there can be no doubt that intemperance, especially in the form of dram-drinking, so common amongst the lower orders in large towns, not only, by the cachectic state which it induces, renders the individual more susceptible at all times of the direct causes of the disease, but also the relaxed and enfeebled condition both of the nervous and vascular systems which succeeds the excitement produced by alcohol, greatly aggravates this susceptibility, and renders the subject of it at such times peculiarly liable to become affected by the slightest exposure. It is probably for these reasons that renal disease, more especially in this form, is so extensively prevalent in London and the other large towns in this kingdom.

The causes of the hard contracted kidney are no doubt obscure, owing in great measure to this form of renal disease differing from the others not only in the nature of the degeneration, but also in the absence of all symptoms by which the progress of the disease is marked, the first intimation of its existence being derived from that impaired function of the organ which is the consequence of the morbid change, or from those still more remote consequences—the effect of that impaired function upon other parts of the system. It may be, no doubt, in many instances, associated with a gouty diathesis, but that this diathesis is its alone cause there is by no means satisfactory evidence. It is observed most frequently either in advanced life, or in those who have worked hard, or lived hard.

The prognosis of this disease is, no doubt, in the main unfavourable; but in each particular case much must depend upon its probable character and previous duration. The first form in its first stage is rarely fatal *as such*, the great danger being that it will pass on to the second stage or variety. In early cases of scarlatinous dropsy we have every reason to believe that we still have the former condition to deal with, and, therefore, the prognosis is upon the whole favourable. In the non-scarlatinous cases, the difficulty is to ascertain whether we really have a very early case to deal with, or one of the more confirmed stage of the white or mottled kidney, in which the disease has been for a long time insidiously making way, although the patient may have only just become aware of his illness. An appearance of the lips and countenance denoting a tolerable abundance of red blood, a specific gravity of the urine nearly approaching to the natural standard, and a well-marked history of the recent invasion of the disease, confirmed by evidence of previously good health, are favourable symptoms; whilst a doubtful history of the commencement of the illness, and of the previous health of the patient, a very low specific gravity of the urine, and above all evidence of the secondary effects of uræmia upon other organs, are unfavourable signs. In proportion as we are sure that the disease has passed from the stage of engorgement to that of disorganization, in the same proportion may we be certain that recovery is not to be expected, and in proportion as we have signs of advancing secondary disease from uræmic poisoning, in the same proportion may we apprehend a speedy termination. In the cases of the hard contracted kidney, the ultimate prognosis is equally unfavourable, and the patient is at all times liable to sudden, and possibly fatal, attacks of disease, either of the heart or encephalon, though it is to the latter that he is more especially liable. It is, however, true, nevertheless, that patients may go on under careful management, with this form of renal disease extending from late in the middle period of life to an advanced age.

The treatment of this disease has been reckoned among the opprobria medicinæ; and undoubtedly a large number of cases are beyond the reach of any means we possess, as regards the removal of the lesion, which is the primary cause of the most serious symptoms; but this arises from our having to do not so much with the diseased action producing structural change as with the consequences of destroyed function resulting from a structural change already effected by that diseased action. Under which circumstances it is no more a reproach to medicine that it cannot restore to its healthy and efficient condition a kidney that, as far as that part of its structure upon which its action as such is concerned, has ceased to be a kidney; than it is to surgery that it cannot restore a limb already destroyed by disease or accident. In those cases, however, in which we have to combat the disease itself, and not the effects of those changes, which the disease has effected, art may yet do much. It is only, however, in the first form of Bright's disease that we are so favourably circumstanced.

In the case of the active congestion of the kidney there are two distinct indications to be fulfilled. In the first place we must endeavour to subdue the inflammatory action by general treatment, and promote its subsidence in the affected organs by measures directed specially to them; and secondly, we must endeavour to obviate the effects of the impaired and perverted function of a vital organ upon different parts of the system. In some acute cases in the early stage, when there is reason to believe that the health has been previously good, as in the case of scarlatinal dropsy in a sound subject, blood has been often taken from the arm with benefit; but that this may be safe we must not only have the above conditions, but we must have a sharp and firm pulse, a hot skin, and a complexion evidencing that the blood has not yet been materially impoverished by the drain through the kidneys. Such cases are indeed mostly confined to those occurring after scarlatina, owing to the comparative infrequency of our seeing other cases at a sufficiently early stage. If, however, there be a sharp and tolerably firm pulse with hot skin, and there be any doubt as to the tolerance of general depletion, six or eight ounces of blood may be taken from the loins by cupping. As a general rule, however, where there is pallor, blood should not be abstracted. The next and most generally useful means of fulfilling this indication is antimony, which at once lowers the action of the heart and large arteries, relieves congestion in the extreme circulation, and promotes the cutaneous secretion. It may be given either in the form of pill, with henbane (F. 78),* which will perhaps be best borne when the stomach is irritable, otherwise it is best to use it in solution, beginning with a sixth or a quarter of a grain. In the commencement a saline mixture, such as a solution of citrate of potass or acetate of ammonia, may be used as a vehicle; but when the disease has lasted long enough

* (78) ℞ Antim. Pot. tart. gr. ¼
Extr. Hyoscy. gr. iv.
Ft. Pil. 6^{ta} vel 4^{ta} quaq. horâ sumend.

to impoverish the blood, salines, which are spanæmics, are to be avoided, though the acetate of ammonia is not liable to this objection. Gentle warmth should be at the same time employed to encourage perspiration, and to this end a linseed poultice applied across the loins will often be found serviceable.

As in these cases the urine will generally be scanty, indeed in the acute stage it always is so, and the system surcharged with fluid, showing itself in the form of great and general anasarca, the question arises, are we to employ diuretics? As a general rule, direct diuretics should not be employed during the early stages of the inflammatory form of Bright's disease, any more than we should administer active purgatives in inflammation of the bowels. It will, however, often happen that under the guarded use of depletion which has been enjoined, and of the antimonial medicines, the urine from having been very scanty and loaded with blood-matter will become much more abundant, and though still containing both red corpuscles and albumen, the proportion will be much reduced, and, by this healthy diuresis, much of the redundant fluid may be carried out of the system without further injury to the kidneys. But even when this is going on we must endeavour to save those organs as much as possible by encouraging the escape of fluid through other outlets. With this object we must continue the diaphoretic treatment, and at the same time have recourse to moderate hydrogogues. For this purpose the compound jalap powder of the Pharmacopœia is a most useful combination. Elaterium, though a most valuable hydrogogue, is to be avoided in this period of the disease, from its tendency to irritate the mucous lining of the intestinal canal. Jalap and calomel may also be occasionally used with advantage in the early stages, particularly in scarlatinal dropsy in young subjects. When the antimony has been continued for a few days, and no irritating or inconveniently depressing effects produced, it may be further increased, and its use continued until the action of the skin has been established and the pulse has become soft.

In some cases, the scarlatinal ones more especially, we find the anasarca disappear and the urine lose its albumen under this plan of treatment, after which, by a more liberal diet, careful avoidance of cold, and gradual return to exercise in the open air—the importance of which in maintaining the healthy action of the skin in the convalescence from the acute form of this disease, as well as in some periods of the chronic forms, is not sufficiently appreciated—the patient will gradually regain his colour and strength, and recovery may be eventually completed, though the greatest care will for a long time be necessary, lest by any imprudent exposure or repressed action of the skin the kidneys should be over-stimulated and resume their diseased action.

One of the great difficulties in the management of this form of the disease has been already alluded to, namely, irritability of the stomach, which is amongst the most prominent symptoms of inflammatory affection of the kidneys, and is peculiarly embarrassing in such cases, as it prevents the use of the antimony, which is the remedy upon which most reliance is to be placed. Under such circumstances the stomach should be as little disturbed as possible, the very least quantity of liquid, to allay thirst, should be allowed. and, if there be not extreme debility, recourse should be had to cupping at the loins; and should this be deemed inadmissible, the dry cupping may be employed; sinapisms should be at the same time applied to the pit of the stomach, and the function of the skin may be promoted by vapour-baths. Should the bowels not be acting freely, an enema containing jalap (F. 79)* will also be a rational means of unloading the system of some of its superfluous water, and determining from the kidneys. By these means we may subdue the more active irritation of the kidneys and relieve the consequent sickness, and thus prepare the way for the antimonial treatment.

It sometimes happens, however, in the progress of these acute cases that we have the sudden supervention of head symptoms. When this occurs with very scanty urine, especially if that urine contain blood, leeches or cupping may be used over the loins; in adults the latter should be preferred, and unless there be dysenteric irritation the jalap and senna enema may be used. If the cerebral oppression continue, dry cupping at the neck may be employed, and if that fail a blister may be applied in the same situation; but in all the earlier cases of this disease it is better to avoid the use of such a remedy where it can safely be done, lest the lytta should irritate the kidneys by absorption into the circulation.

The question has frequently been raised, as to how far this inflammation may, like several others, be subdued by mercury; experience answers that it seems but little amenable to such treatment; and, further, that there are conditions connected even with the earlier period that render mercury a dangerous remedy; first, because there is present, sooner or later, a deficiency of red corpuscles, which is always aggravated by mercury; secondly, because, though there may be no great degree of pallor, or manifest signs of that state of the system which is usually admitted to contra-indicate mercury, the mouth and fauces often become suddenly and violently affected by it, when this affection of the kidneys exists, even in so slight a degree, that the intolerance of mercury is the first symptom which draws attention to the state of the urine; and lastly, because, in cases where the disease has probably been in an early stage, and the remedy has been very cautiously administered, it has produced disorganizing effects, which can only be accounted for by the supposition that the presence in the blood of retained secretion greatly diminishes, or almost destroys that vitality of the tissues by which the tendency to such effects is counteracted. This sometimes shows itself in rapid gangrene of the anasarcous extremities.[*]

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* (79) ℞ Pulv. Jalapæ, ʒ i.
Infus. Sennæ co. fervent. ℥ viij. Misce.
Ft. Enema.

In the less acute, and more protracted, form of this disease, namely, the large white and the mottled kidney, we must still keep in view the principle of relieving the circulation of the excess of fluid and the excretory matter which it contains, with the least possible excitement of the kidneys. For this purpose, when there is no great debility, we may still have recourse to the antimony, especially if the skin be hot and dry. The hydrogogue cathartics may also be employed, either in the form of half a grain of elaterium with eight or ten of bitartrate of potass, or the elaterium may be administered, in very minute doses, say one-twelfth of a grain every three or four hours; but in either case we must guard carefully against its irritating effects upon the lining of the stomach and large intestines. Half a grain of the elaterium, in the form of pill, administered every other morning often carries off large quantities of fluid. In the more advanced stages we may, however, have recourse to gentle diuretics, as we use expectorants in chronic bronchitis. Of diuretics the safest will be the least stimulating, and therefore when there is no great feebleness in the action of the heart, digitalis may be employed in the form of infusion, in doses of from one to two drachms, and with this may be combined the nitric æther. Salines are hardly admissible, not so much on account of their tendency to stimulate the kidneys as from their increasing the spanæmia which already exists; though this objection does not apply to the salts of ammonia, of which we may sometimes employ the acetate, or a draught containing the citric acid saturated with ammonia (F. 80).[†]

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[*] See 'Guy's Hospital Reports,' Second Series, vol. i. p. 205.

[†] (80) ℞ Acidi Citrici, ℈ j.
Ammon. Sesquicarb. gr. xv.
Sp. Æth. nit. ʒss.
Syrupi Aurant. ʒss.
Aq. Puræ vel Mist. Camphoræ, ʒ xi.
Ft. Haust. ter die sumend.

In this form of the disease, serous inflammations are very apt to arise; and there is some difficulty in subduing them owing to the intolerance of mercury. The best means will be cupping in small quantities, the application of blisters, the use of the antimony with digitalis, and purgatives, either in the shape of elaterium or compound jalap powder. In cases where there is too much irritability of stomach for the former, and the latter has not acted sufficiently freely, the draught of tartrate of potass, manna, and senna, will sometimes bring away a considerable quantity of fluid with but very little irritation. The use of hydrogogues is indicated in this form of the disease by the tendency which exists to great serous effusion upon the occurrence of slight inflammatory action, or even without it, and this is peculiarly the case in the lungs, the bronchial membrane, and the areolar tissue about the glottis.

When this last occurrence takes place, which is indicated by dyspnœa, with a whistling respiration, in addition to the above remedies hot fomentation, or rather flannels wrung out of nearly boiling water, must be applied to the throat, and a blister to the back of the neck. Should these measures fail tracheotomy may be had recourse to.

The oppression of the system by the universal dropsy, which gravitates more particularly into the scrotum and lower extremities, suggests the expediency of puncturing the surface to give it exit. This may occasionally be done with advantage, but the punctures or incisions should never be in the legs, owing to the great tendency to gangrene; sometimes the scrotum may be punctured, but as a general rule the thighs are to be preferred. The safest plan is to make a few small incisions with the point of a lancet, which will generally discharge sufficiently freely, though otherwise the puncturing needles may be employed, as recommended by Mr. Hilton; but the greatest care must be taken to keep up the warmth of the part by the use of warm fomentations of flannel.

After we have succeeded in removing the dropsical effusions, and have apparently arrested the disease, or at least subdued the more urgent symptoms, the anæmic state will often continue, being kept up by the continued loss of more or less blood-matter with the urine. Tonics are now indicated, and the anæmia seems to suggest the use of preparations of iron. These must, however, be employed with great caution on account of the tendency to head affection. A good form is the Tinct. of the sesquichloride in doses of ten minims, as is also the syrup of the Pyro-phosphate (prepared by Mr. Bullock, of Hanover Street), in doses of forty minims, with twenty minims of dilute phosphoric acid. As a general rule, however, iron is not a safe remedy; zinc will be found much more so, of which the sulphate may be employed in doses of from one to five grains. The good effect of zinc as a tonic will often be apparent, and by its astringent properties it may be useful in restraining the discharge of albumen; for this latter purpose gallic acid has been employed, and it is said with benefit.

It is apparent from what has already been said, that in these forms of the disease we have to deal more with its secondary effects than with the disease itself; yet if we can succeed in overcoming this, we may direct our attention more to the primary affection, not so much with the hope of its entire removal as with a view to checking the morbid action going on, and so preserving, for the longest possible time, the portion, of the organs, not irretrievably injured. When we have the symptoms of an acute affection supervening upon chronic, we must follow the plan of treatment already recommended for the acute cases; but when we have succeeded in subduing the urgent symptoms, and have, for a time at least, only the chronic kidney disease, as evidenced by albuminous urine, with but few other disorders, to deal with, a system of dietetics and general mode of living must be followed, the chief object of which must be to throw as little work, so to speak, as possible upon them. The action of the skin will now be best insured by moderate exercise; warm clothing should indeed still be used, so as to aid exercise in inducing perspiration, and to prevent its too ready suppression. The diet should be light and unstimulating. It has been proposed to enjoin an abstinence from animal food on the ground of the redundance of azotised matter in the blood; but this plan has not generally been found successful, and in general meat or fish may be allowed once a day. A valuable article of diet also will be milk, when it suits the stomach; and the system may be further supported by farinaceous substances. Spirits and strong wines are to be avoided, but light malt liquor is admissible, as also an occasional glass of light wine. A most important aid towards recovery is removal to a warm climate: a voyage to India, round the Cape and back, or to the West Indies, has in several instances produced, to all appearance, a cure in cases which appeared to have advanced beyond the first stage.

In the still more chronic cases of the small granular kidney, we must bear in mind that the chief dangers are those arising from the frequently sudden effects of uræmic poisoning upon the brain, and the changes (also the effect of uræmia) in the heart and arteries. We must therefore regulate the diet and encourage the action of the skin much in the same manner as in the last, but we must allow but very gentle exercise; and it is doubtful if a warm climate would be desirable. The general tendency in this form may perhaps be not inaptly said to be, to premature senile changes, and therefore we must direct our attention to succouring the powers of the system by every possible means. The diet should be bland and nutritious, but not highly animalized, and, unless custom have induced the necessity, but little stimulants should be used. As the disease may be connected with a gouty diathesis, we must most carefully guard against the retrocession of gout, and if any symptoms show themselves in the extremities they should be encouraged. When there is any threatening of head affection we may apply blisters, or if there be heat or throbbing a little blood may be taken by cupping. Failure of the nervous power, as shown by tremor or gradual paralysis, may be met by sulphate of zinc. When the renal secretion is very deficient, gentle diuretics may be employed, amongst which the Decoct. Scopar. co. of the Pharmacopœia, with nitric æther, may be given; it is, however, very difficult to get diuretics of any kind to act. A steady action of the bowels must be maintained, and when there is no irritability of the large intestines, the compound decoct. of aloes with a little additional bicarb. of potass, and about ten grains of rhubarb, will act agreeably. If care be taken to relieve the kidneys by acting upon the skin, and to avoid all excitement either of the brain or the organs of circulation, life may be prolonged for several years; but such a patient is always in jeopardy, from the different forms of apoplexy to which he is liable, as he is also to sudden death from the heart.

XXV.

URINARY DEPOSITS AND DIABETES.

We have already spoken of the symptoms of a stone, or calculus, as well as of gravel or sand in the kidneys, or passing thence through the ureter into the bladder, as regards the urinary organs; that is to say, as regards the mechanical irritation they produce, considered simply as foreign bodies, in which respect the different kinds of calculous matter pretty closely resemble each other; but the case is far otherwise in regard to their chemical composition, and in great measure also as to their physical properties; and still more so when we have to consider the causes which produce them, and, consequently, the means which must be used for their prevention.

When, therefore, we have reason to suspect the presence of any such matters in the urinary organs, or even the tendency to them, we examine the chemical condition of the urine, not only once or twice but often, with a view to ascertaining not its condition upon one occasion only but repeatedly, that we may be enabled to form an opinion of the habit or diathesis of the patient in this particular; and a knowledge of this will enable us to reason not only forwards, to the probable character of any sediment or secretion, which may be in the urinary organs either *in esse* or *in posse*, but backwards also to several antecedent conditions of the chylopoietic viscera which may have induced a tendency to its formation.

It is known to every one that fresh urine from a healthy person is generally more or less acid, though this may vary from a very decided reaction to almost neutrality, the acidity being the greatest in urine voided just before meals and the least when digestion is going on. This acidity is generally believed to depend, not upon the presence, of a pure acid, but, of super-salts of the alkaline or earthy bases, which the urine contains. Now, although the stronger mineral acids, the sulphuric and the hydrochloric, are both present in the urine, those which we should naturally look for in a free state would be the uric (or lithic) and the phosphoric, not only from their great abundance, but also because either would be liable to be set free, by the stronger ones entering more readily into combination with the alkaline and earthy bases which the urine contains: they do not, however, exist in a free state in the urine of health, but certain of the bases are not perfectly neutralized, and form super-salts with those acids; or, in other words, they form super-urates and super-phosphates.

It is probably upon the presence of super-phosphate of soda that the acid reaction of the urine depends, since it is questionable whether the super-urate is ordinarily present, though the urate of ammonia exists in great abundance, and is readily soluble in water, and in urine in its normal condition. Now this latter salt is, of course, readily decomposed by the presence of any stronger acid than the uric, which, being insoluble, will consequently be precipitated, and accordingly it comes down in the form either of an amorphous sediment, or of minute grains, resembling powdered cayenne pepper; for though uric acid may thus be rendered insoluble in the urine, it does not generally come down in the shape of crystals, since, as Dr. Bence Jones has taught us, the hydrochloric, which is the acid upon which *excessive* acidity of the urine mainly depends, does not immediately decompose urate of ammonia, the combination in which the uric acid exists in the urine, but renders it less soluble, throwing it down in the form of an amorphous powder. We have, then, two forms of uric acid deposits,—the free crystalline uric acid itself, which can only appear when the urine contains a great excess of hydrochloric acid,—and the urate of ammonia, showing itself in amorphous sediments, generally of a pinkish fawn or drab-colour, redissolved by heating the urine, which the free lithic acid is not: but independently of being of limited solubility in cool urine which is normally acid, it may also make its appearance, without being thrown down by excess of acid from its being actually in greater quantity than in perfect health, either absolutely or in proportion to the quantity of fluid secreted. In the majority of instances, the precipitate is dependent upon both these causes.

The immediate, or chemical, cause then of the deposition of uric acid, is excessive acidity in the urine. The probable cause of this acidity is to be found in the stomach, the acidity of which varies, as we have seen, inversely as that of the urine. In cases of extreme irritability of this organ, there is, probably, during digestion, a rapid secretion of hydrochloric acid; during this process, the acidity of the urine would be diminished, or would altogether disappear; but after a reabsorption of the acid, the urine would become proportionally acid; this shows the fallacy of observations upon the acidity of the urine made only once in twenty-four hours, since it is probable that at certain times in the day the urine of a person passing free uric acid may be alkaline. The chemical cause of the deposit of the non-crystallized sediment, the urate of ammonia, is either excess of acid or an unusually large quantity of the urates, often both causes combined. The morbid causes of this condition may be either gastric irritation, as in the case of the uric acid crystals; gout or rheumatism, or other febrile disturbance; or a deficiency in the quantity of water proportionate to the solid contents of the urine, as in the case of obstruction to the portal circulation. In the two latter conditions the urates alone are precipitated, without any crystals of uric acid; but in the former uric acid also is always present if there be a considerable acidity of the urine.

The diagnosis of these forms of disease must depend upon the examination of the deposits both by the microscope and chemically; the latter, however, where there is the least doubt, is the only means to be relied upon. The microscopic appearances of crystalline uric-acid present every combination of the rhombic prism, though these may arrange themselves into forms very likely to mislead. Uric acid is destroyed by heating it to a red heat in a platinum spoon, it burns in fact: when treated with a little nitric acid, and then heated to dryness, it becomes of a deep red, which is always increased in intensity by the addition of vapour of ammonia.

The urate of ammonia is, for the most part, thrown down as an amorphous sediment; as regards the test of burning, and of the addition of nitric acid, it comports itself like the uric acid; but there is this difference,—that though both are dissolved by carbonate of potash, the urate of ammonia evolves ammoniated fumes when the solution is heated, which is not the case with uric acid; and what is still more to the purpose, urate of ammonia is readily dissolved by heating it in water, which is not the case with uric acid. This last test enables us to determine whether urine which obviously contains urate of ammonia, contains likewise uric acid, a question which may always be answered by heating the liquid, when if it becomes perfectly clear the deposit is urate of ammonia, without uric acid.

These two kinds of deposit of uric acid require different modes of treatment according to their cause. When the crystalline uric acid is present, either with or without the urates, the medicinal treatment must consist in the exhibition of alkalis, and the dietetic, in abstinence from acids and all substances likely to become so. For the first, the liquor potassæ, carbonate of potass, saline draughts of citric acid and bicarbonate of potass, and phosphate of soda may be employed; the carbonates of soda and magnesia are sometimes used, but the first is open to the objection, that the urate of soda is insoluble; and the latter, that it sometimes forms concretions in the alimentary canal.

As regards the regimen, we must prohibit the use of vegetable acids, and enjoin a very moderate use of substances containing much starch or sugar, since they readily form a vegetable acid in the stomach. To promote the removal of acid by the skin, and the free evolution of carbonic acid by the lungs, is an indication of still greater moment; for this reason moderate exercise should be used.

The deposit of the amorphous lithates, being dependent upon no great excess of acid in the urine, (when unaccompanied by free lithic acid,) should not be treated with alkaline remedies, at least not as a general rule, since we should rather turn our attention to the disease of which they may be symptomatic. When the deposit occurs as the consequence of slight dyspeptic derangement, or excesses or irregularities in diet, a little additional liquid, as an extra glass of water or soda-water, or a gentle diuretic will, as Dr. Bence Jones observes, dissolve the urate of ammonia, by increasing the quantity of liquid in the urine; whilst we must look to a very moderate diet, and regular exercise, for effecting a cure. But in those diseases in which (as we have pointed out) the urates come down through a want of sufficient water to hold them in solution, owing to disease in course of that circuit through which the water passes from the intestines to the arterial system, diuretics, whether gentle or of a more powerful kind, will have little or no effect, until we obviate the primary disease, if it be possible to do so, or if not till we have in some degree relieved the circulation, by measures adapted to the particular affection.

In connection with urate of ammonia we may allude to the remarkable colouring matter purpurine, which is sometimes present in considerable quantities, but never comes down as a deposit unless urate of ammonia be also present, which has the property of removing the great mass of purpurine from the urine, and assuming thereby a purple tint.* Urate of ammonia, thus coloured, varies from a pinkish drab or fawn colour to that of a rich carmine; so deep, indeed, is the colour that urine in which it has been suspended has not unfrequently been supposed to be coloured with blood; so close, sometimes, is this resemblance, that it is necessary to satisfy ourselves of the absence of the latter by the appropriate tests. It also interferes so much with the solubility of the urate of ammonia with which it is united, that long-continued boiling is necessary to effect its solution; a familiar instance of this is to be found in the pink stain or furr, as it is often called, which adheres to the bottom of the utensil, and for the removal of which the housemaid is often obliged to have recourse to hot water and soda or potash.

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* Dr. Golding Bird, 'Urinary Deposits,' 3rd ed., p. 171.

The brightness of the colour when this deposit is collected in a filter, and the fact that alcohol will separate the purpurine from the urate of ammonia by dissolving the former and leaving the urate, are sufficient characteristics. In examining urine highly coloured by purpurine, care is requisite to avoid confounding the muddy deposit of uric acid thrown down by nitric acid with albumen. This property which purpurine possesses of precipitating urate of ammonia gives it considerable importance in reference to urinary calculi, which thereby receive strata of urate of ammonia which would otherwise have remained dissolved in the urine. It possesses also a further pathological importance from its indicating an impediment to the free secretion of bile by the liver, or perhaps more correctly the purpurine being a more highly carbonized substance than any in the urine, is the form in which that principle appears when the kidneys take on a supplementary action to the liver, and through the liver to the lungs. It does not universally occur in phthisis; and the reason of this is, that, as we have elsewhere pointed out, there may be great disorganization of the lungs in phthisis, yet no considerable defect in the decarbonization of the blood by these organs, owing to the diminished quantity of the blood itself: but if the lungs have become rapidly obstructed, whether by phthisis, capillary bronchitis, or the various other diseases which we have shown to produce that effect, purpurine soon appears in the urine.

Oxalate of lime is another deposit of frequent occurrence in the urine, chiefly, perhaps, important from its tendency to form concretions in the kidneys and bladder. Dr. Bence Jones considers it of very little consequence in other respects, from its being found in the urine of persons in good health, as well as of those in very opposite states of disease. Dr. Golding Bird, on the contrary, regarded it as indicative of derangement of the general health, and therefore of great pathological importance, besides its tendency to form calculi of the most painful form. The truth will probably be eventually found to lie between these two opinions; the frequency of its occurrence, for which fact we are in the first instance indebted to Dr. Bird, is sufficient to awaken our attention to the importance of this form of deposit, whilst the fact of its being often found in the urine of healthy persons, proves that it does not necessarily indicate any great deviation from health, though it may point out to what form of diseased action the patient in question may be more particularly liable. There can be little doubt that a tendency to deposit oxalate of lime is associated with an excessive secretion of uric acid and urea from the kidneys, that it is often accompanied by great nervous irritability, languor, emaciation, hypochondriasis, and want of moral and physical energy, consequent upon a drain upon the system analogous to what may be seen in spermatorrhœa, and in leucorrhœa in females.

The diagnosis of this deposit is very simple: if the urine be allowed to stand in a tall glass for about an hour, and the greater part of it decanted, the portion remaining at the bottom will be found under a half-inch glass to contain minute octohedral crystals. Dr. Rees is of opinion that oxalic acid is formed by decomposition of the urate of ammonia, and Professor Liebig has pointed out the close chemical relation between oxalate of lime, urea, and uric acid; and it is a remarkable fact that oxalate of lime has a great tendency to alternate in the same patient with uric acid or urate of ammonia.

The treatment of the diathesis, if it may be so called, consists in attending carefully to the state of the skin and in regulating the diet. Good mutton once a day, or when the appetite admits of it and the patient requires support, a slice of cold mutton also at breakfast; moderate use of fruit and vegetables, excepting such as contain oxalic acid—such are sorrel, the stalks of the rhubarb plant,—the avoidance of pastry, cocoa once a day in preference to tea or coffee; barley-water or toast-water, or good water itself, for drink, unless the state of the patient seems urgently to call for stimulants, when a little weak brandy and water may be allowed. Nitric acid, or the nitro-hydrochloric extemporaneously prepared may be given, in a bitter infusion, twice or thrice a day. The use, however, of the acids must be carefully watched, as they will after a time produce urate of ammonia in the urine; when this begins to be the case they must be discontinued. When there is anæmia tincture of sesquichloride of iron should be employed, or the ammonio citrate of iron may be given in a state of effervescence with citric acid and bicarbonate of potash; when much nervous debility, sulphate of zinc.

An excess of *sulphates* exists sometimes in the urine, though it does not show itself in the form of any deposit; the sulphates of soda and potash being always present, whatever be the condition of the urine; the sulphuric acid may, however, be precipitated, and its quantity ascertained, by adding a solution of chloride of barium, taking the precaution of adding a few drops of hydrochloric acid to insure the solution of any phosphate of baryta that may be formed.

Dr. Bence Jones gives the following summary of his observations on the occurrence of sulphates in the urine:

1. That the sulphates in the urine are much increased by food, whether it be animal or vegetable.

2. Exercise does not produce so marked an increase in the sulphates.

3. Sulphuric acid, when taken in large doses, increases the

sulphates in the urine; in small quantities it produces little or no effect.

4. Sulphur, when taken, increases the sulphates in the urine, and sulphates of soda or magnesia produce the greatest effect upon the quantity of sulphate in the urine.

The *phosphates*, both alkaline and earthy, are liable to considerable variations as to the quantity in which they occur in the urine, and the latter are often precipitated, producing deposits, and sometimes forming calculi in the bladder. The fact, however, of their being precipitated is no proof of their being present in any unusual quantity, since they may exist in even an abnormal proportion, and remain dissolved; hence the term phosphatic diathesis, commonly applied to the state of the system in which the urine presents these deposits, is hardly applicable. The manner in which earthy phosphates are thrown down from the urine is as follows:

Phosphoric acid is what is termed a tri-basic acid; it can only combine with three equivalents of an alkali or oxide (neither more or less); but these three equivalents need not be of the same oxide or alkali; and one or two of these equivalents may be oxide of hydrogen or water. Thus we have three phosphates of soda. (1) One equivalent of the acid with two of water and one of soda; this, called acid phosphate of soda, has an acid reaction. (2) Again we have another tri-basic salt, in which one equivalent of phosphoric acid is combined with one of water and two of soda; this is the common phosphate of soda, which has a slightly alkaline reaction. (3) Lastly, we have a tri-basic phosphate of soda, consisting of one equivalent of the acid to three equivalents of soda. This salt has a decidedly alkaline reaction; but all the salts are alike tri-basic. The first two exist in the urine, but more commonly the acid phosphate, which probably gives its acid reaction to that fluid; but neither of these is ever precipitated whatever be the character of the urine, since they are highly soluble under all circumstances. The earthy phosphates in the urine are the phosphate of lime, which consists of one equivalent of phosphoric acid to three of lime, and according to Dr. Bence Jones ammonio-phosphate of magnesia. These phosphates are soluble only in a fluid having an acid reaction; and the solution of the acid phosphate of soda is sufficient for this purpose; whilst, therefore, the urine is even slightly acidulated by this salt, there being no alkali or alkaline carbonate sufficient to neutralize it, the phosphates of magnesia and lime will not be thrown down; but urine which is alkalized from carbonate of ammonia, carbonate of soda, carbonate of potash, or the common phosphates of soda, being unable to dissolve these phosphates, they therefore occur as a deposit; hence it appears that the so-called phosphatic diathesis, in which these precipitates occur, is really an alkaline one, since there is not necessarily any excess of phosphate present, in point of fact generally the reverse. For the method of ascertaining the amount of phosphates present, the student should consult Dr. Bence Jones's work on Animal Chemistry and the no less valuable one of the late Dr. Golding Bird on Urinary Deposits.

The following conclusions, drawn by Dr. Bence Jones from long series of observations, if of no other value, are most important as disproving a number of very prevalent errors upon the subject.

1. The variations of the earthy phosphates are so dependent on the earthy matter (lime and magnesia) present in the urine, that no deduction from them as to the nature or state of disease is probable.

2. Neither the earthy phosphates nor the alkaline phosphates are permanently increased in spinal diseases.

3. In fevers, and acute inflammations of fibrous, muscular, or cartilaginous tissues, the total amount of earthy and alkaline phosphates is not increased.

4. In chronic diseases in which the nervous tissue is not affected, no deductions can be drawn.

5. Chronic cases of mania, melancholia, and general paralysis of the insane gave no results.

6. In chronic diseases of the brain, and in chronic and even acute diseases of the membranes, there is no increase in the total amount of alkaline and earthy phosphates.

7. In fractures of the skull, when any inflammation of the brain comes on, there is an increase of the total amount of phosphates. Where there are no head symptoms, no increase of the phosphates is observed, even when other acute inflammations supervene.

8. In acute inflammation of the brain there is an excessive amount of phosphates in the urine. When the inflammation becomes chronic, no excess of phosphate can be shown to exist in the urine.

9. In some functional diseases of the brain an excessive amount of phosphates is observable: this ceases with delirium. Delirium tremens shows a remarkable deficiency in the amount of phosphates excreted, provided no food be taken. Where food can be taken, the diminution is not apparent.

It appears that excess of phosphates in the urine is the effect of a few, though very few diseases; but it is not the cause of any, and therefore requires no directly remedial measures.

With alkaline urine, however, the case is different, since it is not only a sign of disease, but also by the phosphatic deposits which it produces, is the cause of gravel and calculus. Now, we have stated that the carbonate of ammonia will cause these phosphatic deposits to occur in the urine, and carbonate of ammonia is a common cause of alkalinity of the urine; but whence comes the ammonia? This, as is now well known, is produced by the decomposition of the urea—this urea, which is the principal solid ingredient of the urine, and is very prone to decomposition, forming carbonate of ammonia by combination with water, thus:—

$$\begin{array}{ll} \text{Urea} & = C_2\ H_4\ N_2\ O_2 \\ \text{Water} & = \quad\ H_4 \quad\ O_4 \\ \hline & C_2\ H_8\ N_2\ O_6 = C_2\ O_4 + N_2\ H_8\ O_2 = \text{Carbonate of ammonia.} \end{array}$$

Healthy urine does not undergo this change till some considerable time after its excretion from the body; but in disease of the mucous lining of the bladder, ureters, or pelves of the kidneys, the unhealthy mucus, which is secreted, may act as a sort of ferment inducing the change of urea into carbonate of ammonia; but independently of this, there are many morbid conditions, some of them lesions of innervation, and others generally dependent on a low degree of vital power, in which there is either a disposition in the urine speedily to undergo this change; or in the very act of secretion, the elements of urea arrange themselves, instead, into the form of carbonate of ammonia and water. The most familiar instance of this is that of alkaline (ammoniacal) urine, resulting from injuries to the back; this effect being produced, as Sir B. Brodie has pointed out, equally whether the injury is inflicted in the lumbar, the dorsal, or cervical regions. The ammoniacal urine thus present in the bladder, no doubt proves in its turn an irritant to the mucous lining of that organ, which pours out an increased quantity of mucus; the mucus becomes, as it is termed, ropy, by the action of the alkali upon it, and thus the urine itself becomes ropy. This tough mucus is sometimes mixed up with earthly phosphates, which are deposited; and becomes a nucleus for the formation of calculus.

Besides, however, the alkalinity of the urine from carbonate of ammonia, it may also become alkaline from the presence of carbonate of potass or soda, this being the consequence of an increased secretion of acid in the stomach (probably through irritability of that organ), and this increased acidity at one extremity of the digestive process, so to speak, produces a corresponding alkalinity of the other. This alkalinity, however, is not constant, occurring almost exclusively during the process of digestion.

We see then that the *causes* of the phosphatic deposits in the urine are complex. (1.) They depend primarily upon one of these conditions, either an excess in the quantity of the earthy phosphates themselves, or on the urine being alkaline, generally, as in the case of the urates, upon both of these conditions. (2.) The alkalinity of the urine may have a twofold origin, either, that is to say, from carbonate of ammonia, produced by decomposition of the urea, or from carbonate of a fixed alkali resulting from irritability of the stomach. (3.) There may be several conditions favouring the decomposition of the urea, namely, — disease of the mucous lining of the bladder and urinary passages—lesion of innervation, as in the case of blows on the loins, and injuries to the spinal column —and general debility of constitution, from whatever cause arising, whereby a faulty assimilation is produced, and the urea formed in the extreme circulation tends more rapidly to degeneration to the lower substances in the scale of organization, carbonate of ammonia and water.

In regard to diagnosis there are two points to be determined; first, the diagnosis between phosphates and other forms of urinary deposit, and between phosphates the result of ammoniacal urine, and those thrown down by fixed alkalis. The phosphates, which often form calculi in the bladder are, the phosphate of lime, and the phosphates of ammonia and magnesia. They most commonly occur mixed in the same calculus, which is then termed the fusible calculus. The phosphate of lime occurs alone as a precipitate, chiefly from indigestion: the phosphates of ammonia and magnesia chiefly in consequence of diseased bladder, or of the other causes which have been pointed out as rendering the urine ammoniacal. Deposits of these salts are always white, unless coloured with blood, soluble in dilute hydrochloric acid, and insoluble in ammonia or liquor potassæ. The phosphate of lime, which, as we have observed, is generally precipitated with the ammonio-magnesian phosphate, is not so readily soluble in very dilute acids as the former, and therefore, when a mixed deposit of the phosphate of lime and triple phosphate occurs, the phosphate of lime is but slowly acted upon when digested in very dilute acetic acid, which readily dissolves the magnesian salt. When either the triple phosphate or the phosphate of lime is exposed to the flame of the blowpipe it fuses with great difficulty, and not until the heat has been urged to the utmost. If, however, the phosphate of lime is mixed with the triple phosphate in about equal proportions, they readily melt into a white enamel, constituting what has been spoken of above as the fusible calculus; by which property these mixed salts can be readily detected in concretions—a characteristic very available in the examination of gravel and calculi, as the two phosphates generally occur together.* In short, the ammonio-magnesian phosphates are very readily soluble in dilute acetic acid; but the phosphate of lime very slowly so. Both are fused with extreme difficulty; but the mixture of the two, which is the more common deposit, is readily fusible.

The physical appearance (says Dr. Bird)† presented by deposits of the earthy phosphates varies extremely; sometimes, especially when the triple salt forms the chief portion of the deposit, it falls to the bottom of the vessel as a white crystalline gravel. If but a small quantity of this substance be present, it may readily escape detection by remaining for a long time diffused through the urine: after a few hours' repose, some of the crystals collect on the surface, forming an iridescent pellicle, reflecting coloured bands, like soap-bubbles or a thin layer of oil.

The phosphates when very abundant will often present the appearance of thick mucus, from which they may be distinguished by their being readily dissolved by addition of hydrochloric acid: when the pus or thick mucus, as not unfrequently happens, is mixed with the phosphates, the only means of detecting the latter is by placing a few drops of the urine between two plates of glass under the microscope, when the phosphatic crystals will be easily recognized.

The microscopic characters are—(1.) Prisms exceedingly well defined, with the angles and edges remarkably sharp and perfect, the triangular prism predominating, though every variety of termination may be present; these consist of neutral triple phosphates. (2.) Stellated crystals of the neutral triple phosphates, composed of acicular prisms cohering at one end. These, though not unlike crystals of uric acid, in form, are always colourless, and never present the yellow orange of the latter deposit. (3.) Penniform foliaceous crystals, of the basic salt, generally taking place out of the body. (4.) The phosphate of lime occurs either as an amorphous powder, or in roundish particles.

The next question is as to the different causes of the precipitation of the phosphates. When the urine is alkaline from fixed alkali, the cause is gastric derangement; when the urine is alkaline from carbonate of ammonia, the cause is metataxis of the elements of urea, and may depend either upon organic disease of the urinary organs, or upon general constitutional debility.

The broad distinctions between the characters of these two kinds of urine are these. That ammoniacal urine restores the blue colour to reddened litmus, but when the paper is dried, especially if this be done by holding it before a fire, the paper resumes its red tint owing to the evaporation of the ammonia. Whereas when the urine is alkaline from a fixed alkali this blue colour remains, even after exposure to artificial heat. In the former kind of urine the alkalinity is constant, in the latter variable. The former shows prismatic crystals under the microscope, the latter, when fresh, only granular deposit.

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* Dr. Golding Bird on Urinary Deposits, third edition, p. 257.

† Op. cit., p. 258.

In regard to the treatment of this class of disorders, we may first dispose of those cases in which the urine is alkaline, probably from fixed alkali, and the cause gastric irritation. The treatment of these belongs more properly to that of dyspepsia. They are generally attended with pains and distension after meals; the former being often of the character of cardialgia, and penetrating through between the scapulæ, torpid bowels, and not uncommonly depression of spirits, languor, loss of appetite, and white tongue indented by the teeth. These cases often present an excess of urea, as well as a deposit of crystalline or amorphous phosphates.

The treatment must be rather rational than chemical. Exercise and employment, or cheerful recreation, are amongst the best of remedies; to which may be added, the conium and blue pill, twice a day, for a few days, and the compound gentian mixture, with 20 minims of aromatic spirit of ammonia, in the morning. The mercurial should not, however, be continued for more than three or four days; but the aperient tonic may be persevered in. The bismuth with acid or with the conium may be used; but above all things moderate diet and exercise.

The ammoniacal urine may be the result either of general debility, of disease or injury to the spine, or of disease of the bladder. In the first of these cases we must, as before, look mainly to the general condition of the patient, more especially to that of the nervous system. Such patients are often those who have undergone much wear and tear of body or mind, or both, or who have injured their constitutions by excesses. And here, as before, our treatment must be mainly directed to the general health, availing ourselves of the state of the urine, as a help to the knowledge of its condition. These cases are often attended with an excess of urea in the urine, the effect perhaps of an excessive waste of the tissues. In them, as in the former cases, we must have recourse to the tonic aperient, or if the bowels be irritable we may employ the infusion of cascarilla or calumba instead of the mixture of gentian and senna. If the tongue be coated, the pill of hydrarg. cum cret. and soda

(F. 81)* may be used every second or third night, for a short time; but any prolonged use of mercury is to be rigidly abstained from. And when the nervine depression has subsided sufficiently to enable us to dispense with the ammonia, the nitric or nitrohydrochloric acids may be given in the bitter infusion, and at the same time the nervous power may be improved, and the nervine irritability relieved by a combination of sulphate of zinc with extract of henbane, or extract of hop. The zinc may be first given in grain doses, three times a day; and the dose may be gradually increased to four or five. Moderate diet—mutton once a day, and two or three glasses of sherry—avoidance of strong tea or coffee; cocoa for breakfast, when it agrees, is to be given.

In those cases, again, in which, with phosphatic sediment in the urine, there is marasmus and much nervous debility, great anxiety of countenance, a red tongue, thirst, and symptoms in general closely allied to those of diabetes, and probably referrible to shock or injury to the spine, and in which too the deposit is chiefly phosphate of lime, we must pursue the same tonic treatment, combining bismuth with the zinc; and besides this, endeavouring to allay the nervous irritability. For this purpose, Dr. Prout and Dr. Golding Bird concur in recommending opium, or what is better, the salts of morphia. Dr. Bird recommends from one-third of a grain to half a grain of the acetate to be given three or four times in the twenty-four hours, and persevered with for some weeks.

In some cases the constitutional symptoms are not very urgent; the deposit, for this reason, may attract less attention, and the formation of a calculus may ensue. To obviate this, mineral acids have been prescribed, but it is doubtful if any of them, except the phosphoric, ever reach the urine, unless given in doses which are hardly safe. But the nitric, though it may not act chemically upon the secretion, often corrects its alkalinity, probably by its tonic action upon the stomach, and is less likely to cause irritation.

In the last class of cases, in which the urine is ammoniacal from mucus secreted by diseased bladder, our attention must be directed to the primary cause, and our remedies, to obviating as much as possible every cause of irritation. The diet should be light and unstimulating, demulcent drinks may be employed, and the nitric or nitro-hydrochloric acids administered; care must be, from time to time, taken to ascertain that the urine is really ammoniacal, and it must not be hastily presumed to be so merely by its odour. When there is much restlessness and uneasiness, opiates may be employed, and a suppository of ten grains of Pil. Sap. co. will often give great relief. The washing out the bladder from time to time with warm water, should also be steadily persevered in.

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* (81) ℞ Hydr. cum Cret.
Sodæ Carb. exsic āā gr. ij.
Extr. Hyoscyam. gr. iv. Misce.
Fnt. Pil. ij.

The cystic oxide, or cystine, is a substance which sometimes, though rarely, presents itself as a deposit in the urine. It does not exist as an ingredient in that fluid in health. Urine containing cystine, or cystic oxide, is generally of a pale yellow colour, and low specific gravity. This substance, when it occurs as a sediment, is always cystalline, never appearing as an amorphous deposit. The simple crystals are regular six-sided laminæ; but as they generally cohere in a number of super-imposed plates, the compound mass appears smooth. regular, or even sharply crenate, the whole surface being covered by lines which are really the edges of separate crystals. It sometimes forms calculi, which, when first removed, are of a pale brown, though after a time they are of a green colour, not unlike that of sulphate of iron.

This substance is remarkable for the large quantity of sulphur which it contains, though but little is known of its pathological relations, which, however, from the extreme rarity of its occurrence, are practically of but little importance. Cystic oxide is probably, as Dr. Golding Bird suggested, a derivative of albumen: it is remarkable, too, that it generally appears in connection with scrofula, and that the tendency to its formation appears to be hereditary.

The therapeutic indications must necessarily, from what has just been said, be obscure; yet it seems reasonable to believe that those remedies most applicable for the scrofulous diathesis would be best adapted to that in which cystic oxide is present. We could not, therefore, do wrong in prescribing a nutritious diet, free air, moderate exercise, the iodide of iron, and cod-liver oil.

DIABETES.

Diabetes is a disease about the true nature of which there was formerly much uncertainty, and it still exists. Its cause used to be referred to the kidneys; it was thence transferred to the stomach; it then acquired a temporary occupation of the cerebellum; and is now, whether permanently or not, placed in the liver. Still, as the one prominent symptom is the remarkable change in the renal secretion, we have connected it with the urinary deposits.

The invasion of diabetes is generally very gradual. The patient commonly feels weak and languid, and complains of thirst, and it may be that he notices that his urine is becoming very abundant; though in a very large proportion of cases, patients do not mention this symptom till questioned concerning it. Subsequently he loses flesh and strength, though his appetite is often good, sometimes excessive. He complains much of thirst, and of dryness of the fauces; the breath has a sweetish odour, or, if the expression may be used, a sourish-sweet one; the tongue is clammy, red, and raw-looking at the edges, with sometimes a whitish-brown streak down the middle. With the loss of bodily strength, that of the mind also fails. The patient loses the power of continued attention, becomes infirm of purpose, irritable, anxious, or desponding. The symptoms in the majority of cases slowly advance, and, after a period of months, or sometimes years, he gradually sinks exhausted; or phthisis rapidly develops itself, and speedily puts an end to his life. Sometimes there is sudden death.

The one characteristic symptom is the presence of sugar in the urine; the prominent one, sooner or later, is the excessive quantity of that secretion; hence its name, diabetes, from διαβαινω, "I pass through," though the connection between the excessive flow of urine, highly charged with sugar, and the other symptoms, is not at first sight very apparent. Into the extended investigation connected with this subject it is not our province to enter; we therefore content ourselves with a very brief summary of the facts which have been ascertained.

A considerable proportion of sugar is contained in the food we eat, but in addition to this, a larger quantity is produced by the transformation of the amylaceous substances which enter so largely into most articles of vegetable diet; which transformation is effected by the pancreatic secretion. This sugar is dissolved and taken up, and conveyed by the veins from the intestines into the portal vein, by which it is distributed through the liver, whence it is brought in the course of the circulation to the right ventricle; but in its passage through the liver it is found to have undergone a remarkable change: this hepatic sugar, or glucose, though isomerically the same, is now found to be capable of being oxidized in the lungs, so that it is made subservient to the purposes of forming carbonic acid, in the generation of animal heat, and also, in all probability, of nourishing the non-nitrogenized tissues, fat, cartilage, &c. We say that the sugar has acquired the remarkable property of being thus changed in the lungs, for ordinary sugar will not be acted upon in the lungs, neither will that which has been changed in the liver, unless it be dissolved in perfect blood—that is to say, that if common sugar be exposed in the blood to the air in the lungs, it remains unchanged; and so with the sugar taken from the blood in the right ventricle, if the blood in which it is exposed to the air in the lungs have been deprived of its fibrine. So that two things are essential. The action of the liver, and perfect blood for a solvent, in order that the sugar may be fitted for its purposes in the animal economy. Now, in diabetes, the sugar is unchanged in the liver, and therefore it remains unchanged in the lungs, the consequence of which is, that being unfitted for the purposes of nutrition or combustion, it remains in solution, and is eliminated from the blood by the kidneys, whose office it is to remove from the blood all soluble matters not capable of serving any further purpose in the system, which substances act as stimulants to those organs, and promote the flow of urine.*

It is not true that sugar can be formed only from amylaceous matters, since animals fed exclusively upon animal matter generate sugar in the liver. (See 'Brit. and For. Med. and Chir. Rev.' for Jan., 1857; and Bernard's 'Leçons de Physiolog. Experimentales.') It appears that the transformation of sugar in the lungs is effected by the action of the oxygen of the air mediately through the fibrine of the blood.

From what has been just stated, it must be very easy to understand the subsequent phenomena of diabetes, namely, the failure of nutrition, the wasting, the hunger, the thirst, the profuse diuresis, the sugar in the urine, the saccharine smell of the breath; but of the nature of the lesion which prevents the healthy action of the liver upon the blood, we know nothing. It has indeed been ascertained, that sugar was present in the urine of animals in whom the fourth ventricle of the brain had been irritated, and hence it was supposed that *there* was the origin of the malady; but the observations of Dr. Pavy have shown that the sugar has, under such circumstances, been duly acted upon in the liver, and that it is not diabetic or morbid sugar which has thus found its way into the general circulation, but only an excess of glycose, or sugar of the hepatic cavæ.

When we prick the mesian line of the floor of the fourth ventricle in the exact centre of the space between the orifices of the caditory and pneumogastric nerves, we at the same time produce an exaggeration of the hepatic (saccharine , and of the renal secretion. If the puncture be effected a little higher, we very often produce only an augmentation in the quantity of urine, which then frequently becomes charged with albuminous matters; while if the puncture be below the indicated point, the discharge of sugar alone is observed, and the urine remains turbid and scanty.

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* For most of the above we are indebted to the researches of M. Bernard and Dr. Pavy.

The diagnosis of diabetes depends upon the detection of the sugar. This may be discovered as follows: To a small quantity of the urine, in a test-tube, add about half its bulk of liquor potassæ, then boil for about two minutes over a spirit-lamp. If sugar be present, the urine will assume a rich brown colour; this is a very convenient test for clinical purposes; but in some rare cases it may mislead: in all doubtful cases, the Trommer's test, of the sulphate of copper and liquor potassæ should be employed.

Another sign of diabetes is the high specific gravity of the urine, which may be as high as 1050, or more; whenever it is abundant, and 1030, or near it, we may suspect diabetes; but we are not to overlook the possibility of diabetes without very abundant urine: such cases have occurred, and perhaps are more liable than others to terminate suddenly.

The treatment of diabetes, from the obscurity of the origin of the disease, must be doubtful and unsatisfactory. The use of amylaceous and saccharine articles of food seems to be contraindicated, and they do, except in very small quantities, increase the flow of urine, and consequent emaciation. But patients will not, or rather cannot, endure the restrictions sometimes imposed. Most vegetables are objectionable, except the cruciferous plants; malt liquor is to be shunned; bread sparingly used, and potatoes and turnips not at all. Let the patient have for breakfast tea or coffee, with plenty of milk, a rasher of bacon, and a little toasted bread. For dinner, beef or mutton, game or fish, with greens or spinach, and Italian maccaroni boiled in milk. Let him drink a little brandy and water. He may have some tea, with a little well-toasted bread in the evening; and as he will want some supper, he may have a mutton chop with maccaroni, or a mess of maccaroni and milk. Of medicines we know of none that have any certain control over the disease. Some years ago, the author recommended the use of ammonia in considerable doses, and although the chemical theory upon which that recommendation was based has since proved to be erroneous, the remedy has certainly been found useful by the late Dr. Golding Bird and others, as well as by the author. A few months ago the author received a letter from a medical practitioner who has been long suffering from diabetes. He said: "I attribute my recovery, under Providence, to the ammonia, the diabetic biscuits, and a tranquil mind." We have generally employed the annexed form (F. 82).* The cod-liver oil may be given at the same time about twice a day; rennet has been recommended, as has also pepsine, but the author has obtained no result from them. The fixed alkalis are not without good effect; and a course of liq. potassæ and taraxacum certainly deserves a trial.

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* (82) ℞ Ammon. Sesquicarb, ℈ ij.
Infus. Cascarillæ, ℥ viij. Misce.
Sumat. ℥ j.—ʒ ij. 6^{ta} vel 4^{ta} quaq. hora.

When the urine is very abundant, about three or four minims of laudanum may be added to each dose of the ammonia mixture; and about five grains of Dover's powder given at night will promote perspiration. The patient should take moderate exercise, and his mind should be engaged either by a moderate attention to business, travelling, or light reading. As the bowels are apt to be constipated, a little castor oil may be given from time to time.

XXVI.

DISEASES OF THE PANCREAS, SPLEEN, AND SUPRA-RENAL BODIES.

Diseases of the pancreas, especially those of an acute character, or such as involve great structural changes, as observed after death, are not common; though it is probable that more minute changes, affecting materially the character of its secretion, and the performance of its functions, may be frequently occurring during life.

We know next to nothing of inflammation of the pancreas, either by its symptoms, or by the changes which it produces. Abscesses have been found around the pancreas, and involving it; but it is doubtful whether they have been primary affections, and an appearance resembling gangrene has also been sometimes detected in the inspection-room.

The pancreas is, however, liable to chronic inflammation or chronic induration, which may produce very serious results. It is often stated that a schirrous pancreas is a not very unfrequent cause of jaundice. Such cases are, however, by no means common on the table of the inspection-room, though an indurated state of the pancreas is not rare in connection with jaundice; the true explanation of such cases being probably that given by Dr. Wilks, that the chronic change affecting Glisson's capsule and the neighbouring parts, and which, extending into the liver, produces cirrhosis of that organ, also involves the pancreas in a similar affection, producing, in fact, cirrhosis of the pancreas; the jaundice being due, not to any pressure of the indurated pancreas, but to contraction of the ducts.

The pancreas may be, indeed, affected by other forms of disease, as cancers and tubercles; and its ducts may be obstructed by pressure from without, and sometimes by calculi within them. The effect of simple disease of the pancreas, as far as it has been ascertained, is extreme marasmus. This arises probably from non-assimilation of the fatty matters in the food. Dr. Bright observed that the presence of fatty matter in the dejections was commonly associated with disease of the pancreas. It is obvious, from what has just been said, that the diagnosis of pancreatic disease must be in the highest degree obscure, and of its treatment we know even less; our efforts must therefore be directed mainly to such urgent symptoms as may arise, and to improving the health and nutrition by such food as appears likely to be most easily taken up into the system. Milk and bread, as containing little or no fatty matters, are perhaps particularly eligible.

DISEASES OF THE SPLEEN.

This organ, beyond all others, is liable to remarkable variations in size, of which the principal examples present themselves in the form of hyperæmia from marsh poison, the ague-colic, as it is commonly termed, and the true hypertrophy, which is a much more formidable affection.

It is well known that persons who have been resident in miasmatic districts, and have contracted ague, have generally the spleen much enlarged. This, however, would appear to be in nearly all cases due to a temporary hyperæmia; since on the subsidence of the ague under appropriate treatment, the spleen returns to its natural size.

The true *hypertrophy* of the spleen is a much more formidable disease, and is always, as far as we know, found associated with that remarkable affection, *leucocythemia* (p. 21). The spleen in these cases is enlarged to the utmost extent, sometimes reaching down to the crest of the ilium, or even below it; this enlargement arising apparently from the increase in its natural constituents. The tissue of this organ presents on examination no morbid appearance: the corpuscles of the spleen are said to be sometimes larger than natural, but in the majority of instances even this does not appear to be the case.

The characteristic symptom is the remarkable one of which we have just spoken under the name of leucocythemia. The blood in this form of disease differs essentially from that in simple anæmia, in which there is merely a deficiency of red corpuscles, but there is a great excess of the white ones; so that if the blood from any part of the body be examined, the latter are equal or more than equal to the former. There is a possible source of fallacy in the diagnosis between this disease and anæmia, especially in the female. In anæmic subjects, females more particularly, the heart is often feeble, one effect of which is impeded circulation through the chest, and consequent engorgement of the liver and spleen, rendering the latter organ perceptible below the margin of the ribs. The previous history of the case, particularly in females, and the examination of the blood, will generally be sufficient to determine the question.

The most frequent termination of this disease is death from asthenia, often preceded by eruptions of purpura, and repeated hæmorrhages. It would perhaps be saying too much to assert that it is necessarily fatal, since some milder cases, apparently of this disease, have recovered; but in well-marked instances the prognosis is decidedly unfavourable.

In the treatment of this formidable disease we at present can do but little, as in its severer forms it is uniformly fatal. The remedies which seem most obviously to be indicated are nutritious diet, and preparations of iron or quina, or both; the citrate of quina and iron, and the syrup of the iodide of iron, are among the most eligible of these medicines.

The spleen is also liable to atrophy, and to become the seat of fibrinous and scrofulous deposits. It may also, like the liver, undergo the lardaceous or waxy degeneration.

Anæmia lymphatica.—Before quitting this subject, we may call attention to the true anæmia, as distinct from chlorosis, first pointed out more than thirty years ago by Dr. Hodgkin, though it has since been in a great degree lost sight of by medical practitioners. Here the blood is a pinkish colour from deficiency of red corpuscles, and there is great enlargement of the lymphatic glands, the spleen also being the seat of adventitious deposit. The distinction between this and the leucocythemia, just noticed, being that in the splenic leucocythemia, there is excess of white corpuscles, and true hypertrophy of the spleen; whereas in the affection of which we are now speaking, there is simply anæmia without excess of colourless corpuscles, and the spleen is enlarged by adventitious deposit. It is in this form of anæmia that the preparations of iodine are most applicable; of these the iodide of iron is especially eligible; the bromide of potassium has also been recommended.

Diseases of supra-renal bodies.—We pass on to the diseases of those bodies which have so long been a puzzle to the physiologist, though they were supposed to present but little scope for the investigations of the pathologist. The genius of the late Dr. Addison has, however, produced a revolution in this respect; and rendered it probable that the physiology of the supra-renal capsules will some day be made apparent by the revelations of pathology.

The announcement of the discovery of what, for want of a better name, we must call 'Addison's disease,' or 'Morbus Addisonii,' has been received with considerable doubt by many, and this doubt has been in a great measure owing to a misapprehension of the real opinions and statements of the distinguished discoverer. It has been too commonly supposed that he merely propounded the connection between the bronzed skin and disease of the supra-renal capsules; whereas he has distinctly stated that he does not attach the greatest importance to the discoloration, and it was only in the course of his investigations as to the cause of the train of symptoms to be presently noticed that that particular affection attracted his attention. What his views really were, becomes apparent from the description given by Dr. Addison himself.

"For a long period I have from time to time met with a very remarkable form of general anæmia, occurring without any discoverable cause whatever,—cases in which there had been no previous loss of blood, no exhausting diarrhœa, no chlorosis, no purpura, no renal, splenic, miasmatic, glandular, strumous, or malignant disease." To these cases Dr. Addison states that he applied the term 'idiopathic anæmia,' and adds :—

"It was whilst seeking in vain to throw some additional light upon this form of anæmia that I stumbled upon the curious fact which it is now my more immediate object to lay before the profession.

"The leading and characteristic features of the morbid state to which I would direct attention are anæmia, general languor and debility, remarkable feebleness of the heart's action, contractibility of the muscles, and a peculiar change of colour in the skin, occurring in connection with a diseased condition of the supra-renal capsules."

The patient becomes languid, weak, indisposed to either bodily or mental exertion; the appetite is impaired or entirely lost, the whites of the eyes become pearly, the pulse small and feeble, or perhaps somewhat large, but extremely soft and compressible; the body wastes, without, however, presenting the dry and shrivelled skin and extreme emaciation usually attendant upon protracted malignant disease; slight pain or uneasiness is from time to time referred to the region of the stomach, and there is occasionally actual vomiting. The sickness and inability to take food are at times very distressing, and there are sometimes signs of disturbance in the cerebral circulation. The discoloration, when present, is thus described by Dr. Addison :—

"The discoloration pervades the whole surface of the body, but is commonly most strongly manifested on the face, neck, superior extremities, penis, and scrotum, and on the flexures of the axillæ, and round the navel. It may be said to present a dingy or smoky appearance, or various shades of deep amber or chesnut brown, and in one instance the skin was so universally and so deeply darkened that but for the features the patient might have been mistaken for a mulatto. In some cases this discoloration occurs in patches, or perhaps rather certain parts are so much darker than others, as to impart to the surface a mottled or somewhat chequered appearance."

To this it may be added that in some of the more acute cases of this disease there is no discoloration of the skin, or, if any, very little; and this was a fact, not only admitted, but pointed out by Dr. Addison himself. It is in these acute cases that a peculiarly offensive odour, spoken of by Dr. Watson as being exhaled by the body and breath of the patient, is most likely to occur.

It is remarkable that, similar as are the symptoms in the majority of cases of the disease, there is no such uniformity in the lesion of the supra-renal capsules, since they have in different instances been cancerous or tuberculous, enlarged or wasted. Dr. Wilks, however, has shown that there is, notwithstanding, in the best-marked cases of Addison's disease a peculiar amorphous deposit of a fibrino-lardaceous or lardaceo-cretaceous character.

The diagnosis of this disease in its well-marked and simple form is not difficult. In the acute cases, though there may be, as we have pointed out, no bronzing of the skin, the absence of every other appreciable lesion by which to account for the anæmia, emaciation, and exhaustion—we might almost say *withering* of the system, will generally enable us to recognize this disease. In the more chronic and well-marked cases the disease which most resembles it is pityriasis: this latter affection, however, is *on* the epidermis; whereas in the bronzed skin the discoloration is beneath it. Partial discoloration, as, for instance, ephelis, need not mislead, though it may be worth remarking that where there is a tendency to this disease such accidental discolorations are apt to be aggravated.

It is as yet almost idle to talk of remedies for this fatal malady. We may, however, remark that the symptoms, as well as the seat of the disease, suggest the notion of implication of the ganglionic nerves, and that possibly some relief may be obtained by the use of electro-magnetism, and small doses of nux vomica or strychnia.

The remarkable discovery of Addison has opened a wide field for investigation, and every one who has any sympathy with patient industry, conscientious devotion to a profession, and a rare, but carefully disciplined talent for observation, must regret that he did not live to finish, or at least to advance what he had so well begun.

XXVII.

INFLAMMATORY DISEASES OF THE ENCEPHALON.

The contents of the cranium, like those of the other cavities of the body, are liable to attacks of inflammation, but it unfortunately happens that, important as are those affections, there are none of which the diagnosis is attended with greater difficulties. These inflammations have been by most authors included under the term phrenitis, though some have restricted this word to inflammation of the membranes, commonly known as meningitis, whilst inflammation of the substance of the brain has been described as cerebritis, a barbarous word, for which, nevertheless, we are in want of a substitute. Whilst, however, it is highly convenient for the purposes of pathological anatomy to restrict the terms meningitis and cerebritis to inflammation of the membranes and the cerebrum respectively, it is perhaps more expedient for the purposes of practical medicine to retain the term phrenitis in its original signification of inflammation of the encephalon; and the reason why we would do so is, that, notwithstanding the careful observations of Abercrombie and others, we are not as yet in a position to speak of the two diseases as capable of separation in practice, however distinct they may be in their anatomical condition. By phrenitis then, or encephalitis, we wish to express a group of anatomical changes, which, as a group, are allied to a certain class of symptoms, but which symptoms cannot at present be *individually* connected with corresponding anatomical changes; just as we might have spoken of thoracic inflammation generally, before the introduction of auscultation, as including a variety of anatomical changes, and presenting a large group of symptoms which we were unable upon the instant to connect severally with the appropriate pathological changes.

The inflammatory appearances to which we refer are—

1. Thickening or opacity of the arachnoid, effusion of lymph or pus between the layers of the arachnoid, or between that membrane and the pia mater.

2. Softening of the substance of the brain; the softened substance being sometimes of a red colour, constituting the *ramollissement-rouge* of the French authors, or it may be of a yellowish colour, sometimes from infiltration of puriform matter, at others from change in the red corpuscles of the blood. Effused blood may sometimes have been the cause of the disorganization, but there is equal reason to believe that in many cases the former may have been the effect of the latter. Another form of softening is simple loss of cohesion without change of colour.

3. The formation of circumscribed abscess in the cerebral matter.

4. Induration, with increased vascularity of some portion of the cerebral matter.

The symptoms of phrenitis present almost as great variation as do the morbid appearances.

In the best-marked cases of inflammation within the cranium we have, in the first place, fever of a decided character, but not more violent than in some other forms of febrile disease, perhaps hardly so much so. This is followed by acute shooting pain in the head, sickness, intolerance of light and sound, generally with a contracted pupil, particularly in the most acute cases, and where the membranes are involved. The pulse is firm, not hard, often rather sharp, seldom remarkably frequent, sometimes slower than natural, the skin rarely very hot or dry. These may be regarded as the general symptoms of commencing inflammation within the cranium, which, if not speedily removed, are generally followed by others which indicate, with some degree of probability, though by no means with any approach to certainty, the particular tissue of the encephalon, or, it may be, part of the brain involved. Thus there may be delirium often coming on in paroxysms, or partial and temporary loss of recollection, convulsions, strabismus, with dilatation of the pupils, sometimes of one only; or there may be increased contraction; sometimes blindness more or less complete; partial paralysis, which is sometimes temporary. These symptoms are generally terminated by coma, more or less profound. The pulse, which at the supervention of the second series of symptoms generally becomes slow, increases in frequency at the latter stages, and at last is generally characterized by extreme rapidity. The bowels, especially at the commencement, are commonly torpid, and acted upon with great difficulty, and the urine scanty. The tongue at first is generally whitish, not exactly dry, but rather more so than in health.

As a general rule it may be laid down that convulsion is symptomatic of inflammation of the membranes rather than of the substance of the brain, and paralysis, especially when partial, belongs more to the latter affection. In inflammation of the membranes the pupils are more contracted, the intolerance of light and sound greater, the pulse quicker, and the fever generally of a more active character. In inflammation of the substance of the brain, on the other hand, we have as frequently dilated pupil, paralysis, slow pulse, and a greater tendency to typhoid symptoms. To the above rules there are certainly exceptions, and consequently, though there exists a great variety in the symptoms in different cases of encephalic inflammation, we are as yet unable to account for them by the particular tissue affected.

Cerebral inflammation, especially of the membranes, may be excited by the ordinary causes of inflammation, as, for instance, exposure to vicissitudes of temperature, and also to the direct solar ray in hot seasons or in hot climates. It may also be induced by whatever powerfully influences the circulation within the cranium, whether affecting the blood itself or its moving powers. Thus it may arise from mental anxiety or excitement, as well as from the excessive use of spirituous liquors. It may also be induced by poisons in the blood, whether generated in the system, as in uræmia and some forms of jaundice or derived from without, as those of the exanthemata. Disease of the arteries may also give rise to it, though not generally of an active character, and it may be brought on by delirium tremens and rheumatism. External injuries and disease of the bones of the head are among the most common causes of cerebral inflammation, and amongst these we may particularly notice, disease of the petrous portion of the temporal bone, from otitis.

The diagnosis of phrenitis is highly important, but no less perplexing. It is, however, a great assistance to bear in mind that there are three diseases with which it is more particularly liable to be confounded, namely, fever, either continued or eruptive, acute mania, and delirium tremens; and, as Dr. Addison well remarks, the difficulty is the greater, as each of these diseases is apt to be accompanied by more or less inflammation of the brain or its membranes. From ordinary fever it may commonly be distinguished by there being less oppression, and by the delirium being generally more violent and earlier in its appearance, and by the pulse being sharp and more commonly irregular, and the skin less hot than in the commencement of fever; though, on the other hand, there do occur cases in which the fever is more marked, and the local symptoms less severe than in well-defined cases of phrenitis, the pulse being soft and not irregular, and these cases certainly do for some days remain involved in the greatest obscurity until some more decided (though often partial) effects of cerebral lesion begin to show themselves. Sickness, again, though a very general symptom of cerebral inflammation, is sometimes wanting, and, on the other hand, it is not uncommon at the commencement of fevers, especially of the exanthemata. It is, however, fortunate that those cases which most resemble fever at the commencement are precisely those which are the least benefited by active antiphlogistic measures.

From delirium tremens the disease may generally be distinguished by the harder pulse and drier skin (the skin in phrenitis being less dry than in fever, but much less moist than in delirium tremens), and contracted pupils. The scanty urine and the whiter and drier tongue, will also greatly aid in the diagnosis.

From acute mania, phrenitis may be distinguished by the disorder being in the former almost entirely mental, with little or no evidence of derangement of the general health, with the exception of more or less disorder of the digestive functions. The delirium is also more apt to occur in paroxysms, in which, indeed, the pulse undergoes some acceleration, but seldom or ever to the same extent as in those forms of phrenitis which are attended by active delirium.

From hysteria the diagnosis of this, like almost every other disease, may be difficult; and here, as in mania, we must be guided by the sharpness, frequency, and irregularity of the pulse, which are for the most part wanting in hysteria. The disturbances of the uterine functions must also be taken into account, though it must not be forgotten that suppressed menstruation may induce active phrenitis.

The cephalalgia of dyspepsia may become so intense as to give rise to the suspicion of inflammation of the brain, but in the former there is more obvious disturbance of the digestive organs. The diagnosis, however, sometimes requires great care and attention to the symptoms of phrenitis above noticed, and the more so, as in dyspepsia, though the pulse is rarely much accelerated, it may become irregular.

Inflammation of the nervous centres may certainly give rise to pains very similar to those of rheumatism, and what is more, it is by no means impossible that it may actually give rise to such pains, accompanied by swellings closely resembling those of acute rheumatism. The absence of these swellings will, in the majority of cases, assist us in our diagnosis; but when they do occur, which is but rarely, and perhaps more commonly in connexion with disease of the spinal cord than of the brain, the diagnosis becomes in the highest degree obscure, until some decided symptoms of nervine lesion begin to manifest themselves. The absence of the rheumatic odour may often assist us. Though not necessarily present, it is rarely wanting in any case of anthritic inflammation truly rheumatic.

The prognosis of all forms of cerebral inflammation is essentially doubtful, and in the more insidious cases, and those especially which have been overlooked at the commencement, unfavourable.

A considerable proportion, however, of severe cases, and those in which the symptoms are most clearly marked, recover under active antiphlogistic treatment. Of such measures the most important are bleeding and purging. In all well-marked cases blood should be drawn in the first instance from the arm, according to the state of the pulse; and in the more doubtful cases, and where the pulse is soft, we should administer an active aperient; and unless there be decided contra-indications from the state of the pulse, apply cupping-glasses either to the nape of the neck or behind the ears. Of equal, or perhaps more than equal importance to abstraction of blood, is the energetic use of purgative medicines. The bowels in most cases of acute cerebral inflammation are obstinately constipated, from a defect, possibly, of innervation; therefore, to overcome this condition, to relieve the circulation, and it may be to produce a revulsion, active purgatives are required. These remedies should be exhibited from the first, and need not interfere with the other depletory measures. Three or four grains of calomel, with twelve or sixteen of Pil. Coloc. co. should be administered just before or after the bleeding, and this should be followed, in about three hours, by one of the more active cathartic draughts, and should this not operate speedily, the colocynth and calomel may be again administered, and if the bowels are not freely acted upon, a cathartic injection (F. 83).* After the action of the bowels has been established it should be freely maintained by repeated doses of calomel, about two or three grains every four hours, and the mixture of magnesia with the sulphate, in the intervals; and the effect of these may be further promoted by a terebinthinate enema. The purgatives must be steadily continued until the symptoms subside, unless there be such exhaustion as to forbid their continuance; "for," says Dr. Abercrombie, "my own experience is that more recoveries from head affections of the most alarming aspect take place under the use of very strong purging than under any other mode of treatment." When not contra-indicated by the irritability of the stomach, antimonials are of service, by diminishing the force of the circulation, and perhaps also by their action upon the capillaries. Under these circumstances we may in the mixture for the carbonate of magnesia substitute a small quantity of tartar emetic as follows (F. 84).*

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* (83) ℞ Pulv. Jalapæ, ʒ ij.
Infus. Sennæ co. Oct. ss.
Decoct. Avenæ, Oct. ss. Misce.
Ft. Enema.

At the commencement of the disease the powerful application of cold to the head is often of great service. This in general is best effected by means of ice in a bladder, and should be persisted in as long as there is any disposition to undue heat of the scalp, or increased action of the carotid arteries. Its application also requires attention on the part of nurses and attendants, since if it be not steadily employed there is apt to supervene a reaction which may be injurious.

The application of blisters, in the early stages of this, as of all other inflammations, is objectionable, but after the activity of the disease has subsided, and there is threatened coma, they may be used on the head and upper part of the spine. The generally very small quantity of the urinary secretion would seem to indicate the use of diuretics, and of these, the digitalis is perhaps the most appropriate, from its effect in controlling the action of the heart. To the use of mercury we have before alluded, but chiefly with reference to its purgative action, and doubtless it is upon this that its beneficial action mainly depends. There are, however, many practitioners of very high authority who rely much upon its specific action in this disease; and there can be no doubt that many cases have begun to improve just at the time that the gums were becoming tender, and to promote this object they recommend inunction, in addition to its internal administration. This is a practice of which it may be said, that it does not interfere with, but rather aids, other modes of treatment; and that, if the patient survive long enough to be endangered by the effusion of lymph, or serum, it has a tendency to prevent these consequences; but when employed, it must not be in such a manner as to interfere with its purgative action, under the idea that its specific effect may be lost by its running off by the bowels, since whatever may be the benefits derived from the specific effects of mercury, they are—when there is undoubtedly active cerebral inflammation—second to those which may be obtained by relieving the circulation through the medium of the bowels, and as far as possible by the kidneys at the same time. On the other hand, too, it must be borne in mind, that the same principle for which we have contended in the treatment of pneumonia, applies also in the case of phrenitis, namely, that when

* (84) ℞ Mag. Sulphat. ℥ iss.
Antim Pot. tart. gr. j.
Aq. Menth. vir. ℥ vj.
Sumat. part 6^{tam} $4^{\text{tâ}}$ quâq. horâ.

the inflammation is of low form, and the powers of the system reduced, so as to produce a tendency to disorganization, this tendency is much aggravated by mercurial action; and it is by no means improper in such cases, when the pulse is soft, the pupils dilated, and the skin perspirable, to administer stimulants, carefully, however, watching their effects. Ammonia should first be tried, in combination with the infusion of serpentary, and afterwards wine may be allowed if the bowels are not confined, and the urine abundant. We do not, however, mean to say that mercurial preparations are in such cases to be entirely set aside, for the exhibition of a grain of calomel two or three times a day, may have the effect of keeping up a sufficient secretion from the liver, but what we mean is, that it is not necessary or expedient to push it to salivation.

The *acute hydrocephalus* of children is a disease which combines all the varieties of symptoms above stated, and many of the anatomical charges which have been there described, though it has received its name solely from the effusion of fluid into the ventricles, which almost always takes place when it is sufficiently protracted; notwithstanding that it may prove fatal before any such effusion occurs. The appearances found on dissection are, in a great majority of instances, effusion of serum (with very little albumen) into the ventricles of the brain, and a dryness of the surface, sometimes explained by the closure, by lymph, of the opening into the fourth ventricle. These appearances, with the exception of the last, which is by no means constant, are not in themselves certain proofs of inflammatory action, "but as we find in a large proportion of cases which during life have presented the symptoms under consideration, the unequivocal marks of inflammation coexisting with the effusion into the ventricles, and sometimes existing without it: and as we find also that the chief symptoms in those undoubtedly inflammatory, are just the same as those which present on dissection the effusion only, we can have no reasonable doubt that the effusion, when preceded by those symptoms, is to be regarded as an effect of a diseased action, either so truly inflammatory, or so nearly resembling inflammation, as to demand the same practical consideration." This reasoning is not, however, entirely unexceptionable, since the majority of the symptoms are referrible, mainly, to the disturbance or suppression of the functions of the brain; and since it is in accordance with the principles already laid down, to believe that they would be nearly similar, whether that suppression or irritation arose from the effect of inflammatory action, or from structural change independent of such action, or even as a purely nervine disease, without any change whatever cognizable by our senses; unless, indeed, it can be shown that there are in all cases the symptoms which belong, in general, to inflammation, independently of the part affected: and whether this be conceded or not, it must be admitted that cases of hydrocephalus present a great variety as regards the activity of the disease, and the signs of inflammatory fever. The most probable conclusion seems therefore to be, that in the majority of cases the disease is of an inflammatory nature, though this inflammation is rarely of a very active or sthenic character, and arising generally in subjects of a tuberculous or strumous diathesis; but that in such subjects an effusion passive, or nearly so, accompanied by softening of the central parts of the brain, may take place without any inflammatory action, or that of so low a character as hardly to deserve the name; and the appearances on dissection are often such as lead to the belief that some of these changes have preceded any of the inflammatory symptoms, and that the inflammation has occurred as a consequence, rather than a cause; as in the case of intercurrent pneumonia in tuberculated lungs.

The symptoms of this disease are generally of an insidious character, in which respect, it resembles those which have their origin in some defect of the constitution, inducing a liability to aplastic, or caco-plastic deposits, rather than those of a truly inflammatory origin. A child, often of a strumous family, and generally with a large cranium, or of a very excitable or restless disposition, is observed to be more than usually irritable, turns from the light, and not unfrequently has an increased appetite for food; the bowels generally are confined, and the urine scanty; the child often appears languid, sometimes drowsy, and is disposed to lay its head on its mother's or nurse's lap; if old enough to make its feelings known, it complains of giddiness, or appears apprehensive of falling, and refers its uneasy feeling to the back of the head, which is often drawn backwards when the child lies down to sleep; the pulse is frequent, the breathing hurried, and the sleep is disturbed by starting or screaming. These symptoms, which constitute those of what may be termed the first, or premonitory stage of the disease, are sometimes so slight as to be overlooked, though in some instances they are perhaps altogether wanting, and the pain in the head, with more active symptoms, come on suddenly upon a state of apparent health, constituting what is commonly termed the second period of the disease.

In the *second stage* there is severe pain in the head, with screaming and knitting of the brows, intolerance of light and sound, increased heat of scalp, with throbbing of the carotids. There is often strabismus, and the pupils are generally contracted, sometimes unequally so, and occasionally they may be dilated, though probably this latter condition belongs properly to the next stage of the disease. There may be sudden convulsions; the hearing is painfully acute: there is frequent vomiting; the bowels are obstinately confined, but the abdomen flat; the urine scanty; there are, in the cheeks, alternations of vivid flushings and death-like paleness. There is generally great restlessness, and the child requires to be continually moved, or taken into the arms when awake; in sleep there is constant moaning and grinding of the teeth. At this period of the disease, we may have sudden and very great variations: thus, a day on which all the symptoms appear to have been much aggravated, may be followed by one in which they seem almost entirely to have subsided; but this appearance of improvement, or almost of recovery, is most fallacious, and may be followed by a day of still greater excitement, and these alternations may recur for several days. It sometimes happens, too, that the pulse sinks suddenly to the natural standard, a change which is often premonitory of the supervention of the *third stage*, or that of coma, the invasion of which is commonly gradual. The coma is occasionally interrupted by screaming, convulsions, rolling of the head, and jactitation of the limbs. The pupils, during this period, are almost always dilated, and unaffected by light, the sight appears to be imperfect, and the cornea becomes dim; the pulse again becomes very quick, the teeth are clenched, the countenance loses all expressiveness, the evacuations are passed involuntarily and frequently; there is more or less paralysis before the fatal termination, which is generally preceded by some severe convulsive attacks.

We have already alluded to the fallaciousness of rapid apparent amendment in this disease; but on the other hand, we must not forget that after the coma has been apparently established, and death seems from hour to hour imminent, the patient will pass gradually, or, in some cases almost suddenly, into a state of permanent convalescence

The causes of hydrocephalus resolve themselves into two classes, the constitutional and the extraneous. The constitutional consist almost entirely in the scrofulous or strumous diathesis. Infancy and childhood being, as we have elsewhere pointed out (p. 121), the periods of life at which this diathesis is most prone to manifest itself in the encephalon. In addition to the period of life and the strumous diathesis, the circumstance or condition which induces the greatest susceptibility of this disease is any more than ordinary activity or excitability of the brain; hence the remark not uncommon in families who have suffered from this fatal malady, that it is generally the most lively and intelligent children who have been carried off by it.

These conditions may coexist to such a degree that the disease may appear to originate spontaneously, without any immediate cause. Yet it is most commonly induced, even in the predisposed, by some circumstance or accident disturbing the circulation generally, or particularly any that excites or stimulates the brain, and thereby increases the activity of the cerebral circulation. Of these, the most frequent are exanthems or other febrile diseases (not to mention that the state of debility which follows them often increases the liability to hydrocephalus, though it may not be sufficient to set it up of itself), teething, gastric disturbances, and confined or disordered bowels, falls or blows on the head, mental excitement, over-exertion of the intellectual faculties, and the too great emulation which some of our schools, even for children, encourage, often induce or accelerate it. Otitis and otorrhœa are not rarely the causes of this as well as of other inflammatory affections of the encephalon, and should always excite caution or even alarm.

The diagnosis of hydrocephalus is often almost as obscure as it is important: in young girls it may be sometimes simulated by hysteria, in those of both sexes by phrenitis, and in young children by infantile remittent. The distinction of hydrocephalus from those diseases with which it may be confounded, and which have their origin in the digestive organs, rests mainly upon the more decided reference of all the disorders, feelings, and actions to the head. Thus we have from the first irritability or drowsiness, knitting of the brows, aversion to light, disordered vision, or excessive sensibility to sound; to which may be added, altered disposition, great irregularity, often slowness, of the pulse, *costive bowels, but without tumescence* of the abdomen, and scanty urine. In subjects approaching the period of life in which we should expect phrenitis rather than hydrocephalus, the question as to which class any particular case in question may belong is one rather of names than realities, since the forms of disease may merge so insensibly into each other that it is next to impossible to draw the limit; but it is a real and vital question as to whether the case is one of the more active and sthenic inflammation to which the term phrenitis is more properly applied, or of the strumous and more disorganizing hydrocephalus—a distinction not unlike that between pneumonia and phthisis. The age and diathesis of the patient, the greater or less rapidity of the disease, the contracted or passive pupil, the sharpness of the pulse, may help to decide whether the disease approaches to the more or less active affection.

The prognosis of hydrocephalus is commonly stated to be generally unfavourable. It would perhaps be nearer the truth to say that it is essentially so, and can only be said to be doubtful so long as the diagnosis is so likewise ; and the reason is probably this :—that hydrocephalus being a disease almost always of a strumous or disorganizing character, beginning in the central parts of the brain, which we know admit of a much greater amount of injury being inflicted upon them without their manifesting any well-marked signs of such injury, than do the more superficial parts of the organ ; we can readily believe that disease of this character may have produced an irreparable amount of mischief before it could have extended itself to the surface, that is to say, before it could have manifested its most characteristic symptoms ; and in a question of so much difficulty as that between hydrocephalus and the more active though less certainly fatal disease of phrenitis, affecting chiefly the membranes, we may always give the patient the benefit of the doubt ; though this doubt will be greatly lessened by a knowledge of family predisposition, or by evident signs of the strumous diathesis : yet where the diagnosis is rendered pretty certain by the subsequent progress of the disease, we must not lightly be induced to give up our fears by delusive appearances of amendment, such as, subsidence of the pulse to the natural standard, or the other remission of symptoms already alluded to.

After what has been said of the prognosis of hydrocephalus, it need hardly be added that the result of almost every mode of treatment is far from satisfactory; and perhaps the best that can be said of any is that it is most successful in those cases of meningitis or phrenitis which most closely simulate true hydrocephalus. And a stronger proof of this need hardly be required than the efficacy often ascribed to mercury, which reason as well as experience teaches us, is more probably injurious than beneficial in true hydrocephalus. Wherever, in fact, we have the family and individual history of previous liability, with the premonitory signs and characteristic mode of invasion of true hydrocephalus, by which we mean the central softening, with effusion into the ventricles ; in these we should expect *à priori*, and shall generally find, if we make the experiment, that the action of mercury may be established, so far at least as to produce the green stools, which are the surest signs of its specific action in children, without any corresponding effect upon the symptoms of the disease. Whereas, in more rapid and acute cases occurring in robust children whose antecedents are opposed to the belief in the existence of strumous disease, we may often find mercury a valuable adjunct to other remedies.

The treatment of hydrocephalus must greatly depend upon the constitution of the patient, and the period and intensity of the disease. When, as is more commonly the case, we are first called after the disease may be said to be established, and the inflammatory symptoms are well marked, we must attempt to subdue them by evacuants, bearing in mind, at the same time, the delicate constitution, and in most cases tender age of the patient. Now it is well known that in many cases children bear depletion well; if the child be above the age of three years, blood may be taken from the arm to the amount of three ounces or upwards, according to the age of the patient; in a severe case, according to Dr. Watson, we may apply three or four leeches to a child between three and six months old; and six ounces may be taken from the arm of a child of from five to six years old. The same judicious physician observes, however, that these quantities are to be regarded merely as approximations, the true measure of the quantity of blood to be taken being, in all acute diseases, and more particularly in this, the effect which it has at the time upon the system.

Next to depletion, or rather equally with it, the most important measure is active purgation; for this purpose we shall certainly derive much help from mercury: two, three, or four grains of calomel, according to the age of the patient, and followed after three or four hours by an active purgative draught, will generally produce two or three full evacuations, provided the latter be retained; but as there is often much irritability of the stomach, we must not persist in administering it, should it be rejected, but have recourse to cathartic enemata;—about one scruple of powdered jalap in five or six ounces of ordinary cathartic mixture, warmed, will answer well for this purpose in a child of five years old. When the bowels are acting freely, and we wish merely for the revulsive action of the enema, the turpentine glyster may be preferred.

In the second stage of the disease, when the inflammatory symptoms are still active, and the head is hot, we have a most powerful remedy in the application of cold to the scalp. This may be most efficiently done by pouring cold water from a height of two or three feet upon the head; but this mode of its application is apt to be too depressing, and therefore an evaporating lotion, or what is still better, a bladder of pounded ice, is to be preferred. In the use of these, however, we must be guided by the temperature of the head, the cold application being removed when the cheeks become pale or cold. Care must also be taken that the application is constantly cold, as when evaporating lotions are allowed to dry there is often a reaction, and the scalp becomes hotter, and the circulation in the head more active than before its application; the ice-bladders, or the wet cloths, must therefore be constantly applied and carefully attended to, unless withdrawn for the reasons pointed out above. It is in the confirmed hydrocephalus that so much reliance is by many practitioners placed upon the action of mercury, and this confidence appears to be entertained by physicians of high authority; whereas, upon the other hand, there is equally high authority for regarding this remedy as useless otherwise than as a purgative. It is probable, however, that mercury is less useful in proportion as the disease approaches to the true hydrocephalus, and that in the more rapid cases, with greater delirium, occurring in robust children, which are, in fact, cases rather of meningitis or phrenitis than of hydrocephalus, that we may hope for great good from its use. When the bowels are, as is generally the case, torpid, the calomel may be used in doses of about two grains every four hours for a child of four years old, until the bowels are freely acted upon. The effect of the continued exhibition of the mercurial will be the passing of the characteristic dark-green evacuations, which may be taken as evidence of the mercurial action, since young children are rarely salivated, though when that happens, there is much danger of sloughing of the cheeks. When the heat of the scalp and febrile excitement are subsiding, and the patient, if not improving, appears to be passing into a state of coma, blisters may be applied to the nape of the neck, or behind the ears, and in those cases in which the action of mercury is thought desirable, the vesicated surface may be dressed with mercurial ointment. It is at this period, too, that diuretics appear to be specially indicated. When the pulse is not very feeble, digitalis may be given in the form of effusion, in doses of from twenty minims to a drachm, according to the age of the child; the combination of hydrarg. cum cret. with powdered squill may also be used in the proportion of about two parts of the former to one of the latter, and this is perhaps a good form for the administration of mercury. Colchicum has also been highly extolled as almost infallible; but when we have to deal with a disease nearly incurable, we are sure to hear of many infallible remedies.

When there is much irritability and restlessness towards the close of the disease, but no stertor, a moderate opiate will often be of great service; the best form is Dover's powder, in doses of two or three grains. When there is much exhaustion, wine may be administered, and that freely; its effects being carefully watched; and, undoubtedly, cases apparently desperate have recovered under the use of stimulants; though it may well be questioned whether such cases were not rather those of fever, with head affection, than true hydrocephalus.

If the disease in its worst and not least frequent form be thus certainly fatal, it is of the first importance to adopt all preventive measures; and as there can be no doubt of the close connection, not to say identity, between hydrocephalus and tuberculous disease of the encephalon, the principles upon which our prophylaxis should rest must be the same as those laid down for the prevention of other tuberculous affections, namely—(1.) to counteract the tuberculous diathesis by attention to the general health. (2.) To obviate the tendency of this diathesis to localize itself in the part particularly threatened, namely, the encephalon.

For fulfilling the first indication we must apply, according to the age and circumstances of the patient, the principles already laid down. There can be no doubt that the great amount of the strumous disease amongst children in our large towns, arises no less from errors as to ventilation, light, food, clothing, and cleanliness, than from any hereditary taint in the parents. Although some have been found to deny that strumous disease can be generated *de novo* in a child born of healthy parents, yet none can reasonably entertain a doubt, that though the parents may have no hereditary taint, yet if their health be deteriorated by the above causes, their children, who are also in most cases of necessity exposed to the same, will become in many instances the victims of scrofula; and therefore not only should rational prophylactic measures be enjoined upon every opportunity as regards the children themselves, but parents should be made aware that their own intemperance, improvidence, or neglect, may be visited upon their children by early death or ruined health. And this applies with equal force to all classes of society; profligacy and intemperance, or the excitement and bad atmosphere of the counting-house or the gaming-table, on the part of the father, acting upon the health of the offspring no less than the confined workshop or the excesses of the gin-shop; and the same applies to self-indulgence or the drudgery of dissipation on that of the mother, no less than to excessive labour, anxiety, privation, or spirit-drinking.

The careful ventilation of sleeping apartments, as well as cleanliness, require care in all classes, as do also the most free admission possible of air, and solar light; the importance of this latter, as affecting the health of young children, being generally not sufficiently appreciated. The clothing of all children in this climate requires care, especially of those who, either from any family tendency or from locality, may be prone to strumous disease; it should be uniform over the trunk especially, not heating, but composed of material of little conducting power of heat. As regards diet, where the mother is healthy, and has a good supply of milk, the child should be kept at the breast for a year; and when the supply begins to fall off before that time, the child should be fed with arrow-root, or tops and bottoms softened in milk, so as to be *taken through a bottle;* the feeding children with a boat, or even a spoon, before they have teeth being a practice that cannot be too strongly reprobated.

Whilst great care is to be taken to avoid the effects of cold or damp, equal caution must be used to prevent the child becoming too susceptible of its influence, and for the purpose of hardening him against it there is no means more effectual than the use of the bath. Most children can bear a bath of the temperature of the room; but should the circulation be so feeble that there is no reaction after its use, the temperature of the water should be raised five or ten degrees above it.

It is, however, with preventing the disease from localizing itself in the encephalon that we are now mainly concerned; and here we must bear in mind the principle upon which we are to act, namely, the obviating all undue excitement of the organ threatened. To this end precautions should be taken from the first, and amongst the earliest of these should be the keeping of the head cool: the child should be early disencumbered of its cap, both by night and day; here we must, in some degree, qualify what has been said respecting light, since the excitement of a too-powerful light is to be carefully shunned whenever the child evinces the least susceptibility to cerebral irritation. The same applies to loud noises, which are at all times painful; and from the irritation and excitement which they frequently induce, may bring on spasmodic affections: and, therefore, there is good reason to believe that they may promote that determination to the head which favours development of tubercle in the encephalon. When any tendency to tuberculosis is to be apprehended, either from the constitution of the child or from his antecedents, we have reason to fear its development in the brain: and, therefore, we must guard against whatever strongly stimulates the sensorial nerves, excites the spirits, or promotes the too rapid or early development of the intellectual faculties. On these grounds we cannot too peremptorily forbid the tossing, and jumping, and hallooing to children in arms, often practised by heedless nurses or friends; neither can we too earnestly restrain the vanity or injudicious zeal of parents in urging children, with such a tendency (and be it remembered, that such children have generally a precocity of intellect that almost holds out a temptation to doing so), to the exercise of their intellectual faculties, and the attainment of acquirements beyond their age, which, if it does not hasten on a fatal malady, is often productive of a result opposite to that expected: the over-stimulated intellect, like the overgrown body, evincing in the man a feebleness, and want of power of sustained exertion, which the inexperienced would hardly have anticipated from the early intelligence and unusual aptitude for learning of the child. At the same time that these negative precautions are enjoined, we must not overlook the more direct ones of combating the earliest manifestations of cerebral disorders. The state of the evacuations should be carefully watched, and when the bowels are sluggish, a moderate aperient should be, from time to time, administered. For this purpose a good form is the combination of rhubarb and hydrarg. cum cret. or calomel with jalap, which may be helped with from one to two drachms of castor-oil on the following morning. There is, perhaps, some ground for difference of opinion as to the use of iron in such cases, and experience teaches us that, in general, it is too liable either to stimulate the circulation, or to induce congestion, to be in all cases a safe remedy; perhaps where there is pallor, the syrup of the iodide, in small doses, may be used; but iodide of potass, combined with a vegetable tonic, would, in the majority of instances, be a more effectual as well as a safer medicine. The syrup of the iodide of zinc, as prepared by Mr. Davenport, will also be found a most useful medicine, combining at once the alterative properties of the iodine with the tonic but unstimulating ones of the zinc.

The hydrocephalus, of which we have just been speaking, is upon the whole to be regarded as the effect of inflammatory action, though of a low character, and one belonging to a peculiar constitutional diathesis; but there is a form of hydrocephalus which is of a non-inflammatory character, and in its most exquisite form to be viewed in the light of a simple dropsy of the brain, arising, in many cases, from obstructed circulation by occlusion of, or pressure upon, the sinuses, or from atrophy of the brain, through disease of the arteries. In the majority of instances, however, chronic hydrocephalus is the result of antecedent acute diseases of the arachnoid, of that part more especially which lines the ventricles. In the greater proportion of cases, thirty-six out of fifty according to Dr. West, the disease had its origin before birth.

The diagnosis of chronic hydrocephalus is self-evident.

The prognosis is in the main decidedly unfavourable, though there have been many probably of a somewhat subacute character, in which there have been undoubted effusion, and that, too, of a considerable quantity, which has been much reduced by remedies, and probably in the end entirely removed. When the sutures are open, the case is more favourable, both because the brain suffers less from the pressure, and also, because there is greater opportunity for the adaptation of the capacity of the calvaria to the altered volume of its contents.

As this form of the disease is, like the acute, if not essentially and directly of a tuberculous character, at least most closely connected with the tuberculous diathesis, we must direct our dietetic and general treatment to obviating the constitutional tendency; at the same time we may also have recourse to occasional alterative doses of mercury (F. 85).* Care should be taken to insure its moderate aperient action, as it is very doubtful, if there is any benefit to be derived from *direct* action of the mercury upon the system. The remedy, from which, however, most good may be expected, is the iodide of potassium. This will best be used in combination with an alkali, to prevent the iodine being rendered irritating by the salt meeting with any free acid in the intestines; about a drachm of the annexed mixture may be given to a child of a year old (F. 86).† The absorption may, perhaps, be helped, from time to time, by the addition of a small quantity of infusion of digitalis, of which about fifteen minims may be given to a child of a year old: but its use should not be continued for more than four or five days together. Blisters may also be applied behind the ears in children of a year old and upwards. A good rule for their use is to allow the plaster to remain on for one hour, and then remove it; and if there be no vesication at the end of an hour after its removal the same proceeding may be repeated.

The general treatment and hygienic measures for the prevention of chronic hydrocephalus must be the same as those employed against the acute form of the disease.

* (85) ℞ Hydrarg. Chlor. gr. ij.
Sodæ Carb. exsic. gr. viij.
Pulv. Cretæ co. ℈ j.
Sumat. gr. vij.—gr. xvi.; alternis vel 3^{tis} noctibus.

† (86) ℞ Pot. Iodidi, gr. iv.
Sp. Æth. Nit. ʒ j.
Liq. Potassæ, ♏ xxiv.
Syrupi Aurant. ʒ ii.
Aq. Puræ, quan. suf.
Ft. Mist. ℥ ij.; sumat. ʒ j.—ʒ iv. ter die.

XXVIII.

DELIRIUM TREMENS AND MANIA.

Delirium tremens, or the *mania a potu* of the older authors, is a disease which we recognize, and can define only by its symptoms, since it belongs to that class of nervine affections, in which defect or derangement of the nervous power arises independently of any structural change cognizable to our senses.

The whole of the symptoms in this affection, are essentially those of exhaustion, with that state of the nervous functions so commonly associated with it, and which is recognized, amongst medical men, as that of excessive irritability. It attacks exclusively those who have been subject to a long series of extreme nervine stimulation, accompanied by circumstances tending to derange the circulatory and digestive organs. All these conditions are combined in repeated and continued alcoholic intoxication, and therefore it has been regarded as especially a drunkard's disease, and hence the synonyme *mania a potu:* this, however, though true of by far the greater number of instances, is not so universally.

The disease generally commences, or is preceded, by more or less of febrile excitement, during which there is often a sense of horror of some impending calamity, or the patient entertains a suspicion of some plot laid against him; there is a continued movement of the eyes, as if in apprehension of some approaching danger; hurriedness and excitability of manner; a degree of tremulousness in the limbs, and the same is observed of the tongue when the patient is asked to protrude it. This excitement and tremulousness continue until to the dread of approaching danger are added hallucinations, and the patient believes that he sees persons or other objects approaching to do him mischief. In this state of excitement he will, unless carefully watched, elude the restraint of his friends, and walk or run hurriedly for long distances, as if endeavouring to escape pursuit. These hallucinations are accompanied by delirium, the patient generally asserting that he is in some other place, commonly, to all appearance, under the idea that he has been kidnapped or removed by stealth or force; and whilst suspicious of all about him, he is more especially so of his nearest relatives, and those in whom he is used to trust the most; his talking is incoherent, generally, however, in accordance with his hallucinations, or about some disappointment or loss in business, or some subject which has caused him peculiar anxiety of mind. This last form of delirium is more particularly observable in those in whom the disease has been induced by some circumstances other than intoxication. Sometimes, however, there is a degree of hilarity about the patient, and he will sing and be jocose at intervals. It is one of the peculiarities of this form of delirium, that a word will often bring him to a state of reason, though only for a very short time, after which he immediately recurs to his former delusions. With all this excitement, the pulse, though rapid, is very compressible, and the tongue is creamy and moist, the skin perspires freely, the urine is abundant, the bowels, though torpid, not obstinately constipated, and the pupils rather dilated, though obedient to the stimulus of light.

If the disease be not checked by the appropriate treatment, the patient passes into a state of coma, or what is equally frequent, subsides rapidly from excitement to exhaustion, and sinks from gradual syncope. Another danger to be apprehended is the patient's destroying himself, either accidentally in his anxiety to escape from his imaginary danger, or by direct injury inflicted upon himself.

The most common cause of delirium tremens is, as has been stated, intemperance, the disease generally commencing after a continuance of excessive drinking, wound up, perhaps, by an extraordinary debauch. Sometimes, too, the approach of the disease seems to cause an increased desire for stimulating drinks, this giving rise to some very great excess, the depression consequent upon which is the beginning of the attack. Sometimes it happens that, owing to a threatened attack of apoplexy, or some inflammatory affection, real or presumed, the patient is bled, or blood is lost by some accident incurred in a drunken fit; or the state of the liver, induced by alcohol, gives rise to an attack of hæmatemesis, and the loss of blood appears to be the immediate cause of the invasion of delirium tremens. It may be, too, that the sudden withdrawal of his accustomed stimulants brings it on when such stimulants have been forbidden, owing to the patient being under treament for disease or accident. Sometimes a drunkard in a fit of remorse determines to abstain entirely, and this, it is supposed by some, may induce the disease. Intemperance in the use of alcoholic drinks is not, however, the alone cause of delirium tremens; indeed it may be questioned whether it is ever, in the strictest sense of the word, a cause at all, since its effect is merely to induce a state of susceptibility to those influences which are the real causes, and to which intemperate habits render him peculiarly exposed; and many cases have occurred which seem to show that this susceptibility may be induced by long-continued excitement of the nervous system in other ways. The excessive attention to business, where that business is of an exciting kind, has, when the excitement has ceased or been abruptly brought to a close by some heavy reverse, been known to be followed by the symptoms of delirium tremens. Another instance is afforded by the case of a young medical practitioner, of strictly temperate habits, who, whilst successfully but anxiously engaged in a rapidly-increasing practice, became the subject of severe erysipelas, upon the subsidence of which he had an attack of delirium, with all the most characteristic signs of delirium tremens.

The diagnosis of delirium tremens, in its perfect form, is not difficult: from phrenitis it may be distinguished by the softer pulse, the moist tongue, perspiring skin, abundant urine, and by what is perhaps a still more important sign, the dilated pupil: from acute mania it is to be distinguished mainly by the character of the delirium, which is never of the violent character which it assumes in the latter disease, and by the state of the pupil above alluded to; neither does delirium tremens assume the severe paroxysmal type. Whilst, however, we maintain that there is little difficulty in the diagnosis of delirium tremens, in its unmixed form, we would strongly inculcate, what the experience of all must confirm, that the majority of cases with which we have to do are not such; but that they seem to belong to an intermediate condition, between phrenitis on the one hand, and delirium tremens on the other; and it is in appreciating the tendency which exists to either of these affections that the tact of the practitioner will be particularly tried. The history of the disease will not, on such occasions, be always found a sufficient guide; for not only may delirium tremens arise, though rarely, without intemperance; but what is more common, intemperance may induce either phrenitis or mania. It is, indeed, by their characteristic symptoms that we judge of the presence of either of these complications, and when the probability of such complication existing is fully appreciated, there will be no great difficulty in detecting it; thus, if with the delusion, and tremor of delirium tremens, we find a dry, or even, not moist, tongue, a harsh skin, scanty urine, or a contracted pupil; or if the pulse be small and hard, rather than of the full, soft character belonging to delirium tremens, we must regard the case as complicated, and our prognosis and treatment must be regulated accordingly. On the other hand, with many of the constitutional symptoms of delirium tremens, we may have the furious and paroxysmal delirium of acute mania.

The prognosis of delirium tremens must, it is obvious from what has been said, be doubtful. In a first attack, where there are no complications and no very severe visceral disorder, the patient will generally do well. Where the symptoms of phrenitis are mixed up with those of delirium the danger is greater, nearly in the direct proportion of the amount of the latter. Those cases which arise from purely mental excitement independently of intemperance are specially dangerous.

When we have to deal with a case of uncomplicated delirium tremens, our treatment must be simple and decided. The patient must be put to bed, carefully watched, and kept there by gentle means; the head may be shaved, or, if this be not done, the hair must be cut short; and where there is undue heat of scalp, a cold or evaporating lotion must be applied. We must first take care that the bowels are well cleared out, which will be best effected by half an ounce of castor oil, or some rhubarb and calomel; and when this has been done, we may put the patient upon the use of calomel and opium, a grain of each being administered every three or four hours at the commencement, but should this not be sufficient to quiet the excitement, an extra dose of opium, in the form of half a drachm of the tincture, may be administered at night, and this may be repeated in the course of two hours, should rest not be obtained. Should this fail, and should there be no symptoms of the unfavourable action of the opium, as indicated by a dry skin, scanty urine, or, what is most important of all, a contracted pupil, the opium may be repeated on the following night in still larger doses; indeed, when we have a clear case of delirium tremens, we must measure the dose of opium, not by quantity, but by its effects. We cannot, however, enforce caution in the use of opium too earnestly. If the opium should induce contracted pupil, without quieting the patient, it should on no account be repeated, as it is by no means improbable that its continued use under such circumstances will be followed by epileptic convulsions, coma, and death. If too large doses of opium should have been given at night without producing rest, it is better not to repeat it till the following night, but to employ the interval in clearing out the bowels, and administering the henbane and ammonia. In the more mixed cases, however, and they are not the least common, more caution is necessary, and it will be safest, after unloading the bowels, to commence our treatment with a combination of calomel, camphor, and henbane (F. 87);* and, if there be much restlessness, with a pupil inclined to be contracted, a full dose of henbane may be given at night in the form of tincture, adding to it some ammonia when the pulse is feeble (F. 88).† Cases of this kind sometimes go on favourably under the above plan of treatment, or it may happen, that under its influence the more phrenitic symptoms subside, and the disease becomes one of decided delirium tremens, when a full dose of opium will be followed by the best results. Another important question in the treatment of delirium tremens, is the extent to which alcoholic stimulants are to be employed. As has been observed above, the immediate cause of the disease appears in some instances to be the withdrawal of such stimulants, and therefore their use is clearly indicated, and generally it will be best to employ that to which the patient has been most accustomed, though it would appear as often to have been induced by the saturation of the system with alcohol. It is, therefore, to be borne in mind, that alcohol is not the cure for this disease, its use being to obviate that state of the nervous system which supervenes in drunkards when the stimulating effects of drink have subsided, and which may often be witnessed in the gin-drinker before he has had his morning glass, and which favours the development of delirium tremens. The rules by which we must be guided in its use are nearly the same as those which regulate the employment of opium, except that in this case, we must look more to the state of the circulation, whereas in the use of opium, we are guided more by that of the nervous system, a compressible pulse being our best indication for the administering of beer, wine, or spirits.

In those cases which are the result of mental excitement and anxiety, more caution is required, and we must be still more guarded in our use of opium; and alcoholic stimulants will be more rarely admissible. Under these circumstances, the combination of calomel and henbane will be our best internal remedy, and the henbane may be further administered in the form of tincture, in the intervals, sometimes with the addition of Liq. Ammon. Acetatis, if there be not free perspiration; and in such cases, after we see our way more clearly to the use of opium, we may endeavour to calm the nervous excitement, and, it may be, counteract the ill effects of opium, by the continuance of the hyoscyamus during the intervals between its administration. Here also, as in most cases, the best guide for the use of opium is the state of the pupil.

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* (87) ℞ Hydrarg. Chlorid.
Camphoræ rasæ, āā gr. j.
Ext. Hyoscy. gr. iij. Misce.
Ft. Pil. 4^{tis} horis sumend.

† (88) ℞ Camphoræ, gr. ij.
Ammon. Sesquicarb. gr. iv.
Tinct. Hyoscy.
Tinct. Lupuli.
Syrupi Aurant.
Mist. Acac. āā ʒ j.
Mist. Camphoræ, ℥ j. Misce.
Ft. Haust., horâ somni sumend.

MANIA.

Acute mania is another form of purely nervine disease, in which the affection of the brain appears mainly, if not entirely by its functional derangement; structural lesions when they occur being in most instances to be regarded in the light of effects, rather than causes. Though mania is characterized by attacks of furious delirium, coming on in paroxysms, it is sometimes preceded more or less by constitutional disturbance, not of a febrile character, but affecting mainly the digestive organs; there is generally dyspepsia, and sometimes jaundice, for a considerable period. The principal changes, however, are in the nervous functions; and it is, perhaps, characteristic of the disease, that this derangement is beyond all proportion to any bodily disorder. The first premonitory symptoms are often a change of manner and of tastes on the part of the patient, with considerable waywardness and capriciousness; he becomes unusually irascible, or oppressed with anxieties about his temporal or spiritual welfare. His friends, though surprised and annoyed at this alteration, may entertain no serious apprehension, owing to the absence of much constitutional ailment, when suddenly he breaks out into a state of furious madness, and sometimes can be only forcibly prevented doing some serious injury to himself or others. This state of violence may as suddenly subside into one of sullenness and moroseness, or he may even become for a time rational and tranquil, though this interval of remission will be again followed by a recurrence of the madness. When the disease has thus manifested itself, the pulse is generally quick, sometimes full, the bowels torpid, the urine scanty, and the tongue white, and, as it advances, it becomes brown. The pupils are most commonly contracted, and there is extreme sleeplessness. These paroxysms of excitement may continue to follow each other at intervals, unless we can succeed in subduing them, till the patient either sinks exhausted, or passes into a state of confirmed insanity.

As regards the causes of this disease, there can be no doubt that some are born with a susceptibility to it, inherited, it may be, through either parent; and sometimes this susceptibility is such, that the mania is excited by almost unappreciable causes; and the tendency is much increased by an habitually torpid state of bowels, by derangement in the digestive organs, or of the liver or kidneys. The more immediate causes are generally either excessive mental exertion, excitement, depression, intemperance, or venereal excesses.

The diagnosis of mania depends upon the character of the delirium, and the absence of constitutional or bodily disease, in any degree commensurate with the mental disturbance; by the former it may be distinguished from delirium tremens, and by the latter from phrenitis.

In mania, the delirium is more furious, and the delusions are more subjective than in delirium tremens, in which disease they are more of an objective character, whilst there is no attempt at violence to others, unless under an apprehension of danger; the tremor, also, of delirium tremens is wanting in mania.

The prognosis of mania is, in a great degree, dependent upon the cause of the disease. Where there is hereditary tendency, the probability of recovery is less than where the disease has been induced, though it should be observed, that in the latter case, the immediate danger to the life of the patient is not less than in the former. The risk both of life and reason is also greater in a second than in a first attack, and the more frequent the recurrence, the less the chance of the removal of the disease.

The treatment must consist, in the first instance, in endeavouring to subdue the excitement, both of the vascular and nervous systems: as the latter generally preponderates, our chief attention must be directed to it; though it must be confessed that our power over the nervous, is much less than over the circulatory organs. When there is decided heat of scalp, the pulse strong, and the constitution sound, blood should be taken, either from the arm, or by cupping at the nape of the neck. The head, also, should be immediately shaved, and cold lotions, or powdered ice in bladders, applied to the scalp; and, as the bowels are generally torpid, we must have recourse to active aperients; calomel and colocynth should be administered at once in full doses; and an active purgative draught shortly afterwards. The enema with oil of turpentine has an additional good effect, not only as a purgative, but also as a revulsive. Calomel and colocynth, or blue pill with scammony or compound rhubarb pill, may also be continued twice or thrice daily, so as fairly to unload the bowels, and by keeping up a steady action of the intestinal canal, to stimulate the organs which pour their secretions into it, especially the liver. Should sleep not be procured after the above measures have been carried out, we must have recourse to anodynes, or rather to nervine sedatives, as opium is not admissible, as a general rule, in this disease. And here we may be allowed to remark, that hyoscyamus and conium are not to be regarded in the light of mild preparations of opium—though they are sometimes placed in the same category, as though they might be used indiscriminately—for experience teaches us that the difference of their action is not so much one of degree, as of kind: and therefore when a powerful remedy is required, and full doses of opium seem to be contra-indicated, we must not evade the difficulty by having recourse to smaller doses, or less active preparations, the effect of which, as far as they have any effect, will be injurious, but employ hyoscyamus or conium in powerful doses; the draught of the former (F. 88), will be found very useful, omitting the ammonia when there is vascular excitement; as will also the camphor and hyoscyamus in the form of pills. The exhaustion which supervenes upon the repeated fits of excitement, and which sometimes appears early, must be counteracted by stimulants, of which perhaps the safest will be ammonia; this may be given in infusion of serpentary, and where the pulse is very feeble a few minims of compound spirit of æther may be added. At this period also counter-irritation is indicated, and blisters may be applied to the nape of the neck, or sinapisms to the feet.

Throughout the whole of the treatment, the utmost vigilance is required to prevent the patient inflicting injury either upon himself or those about him; care must also be taken to exclude all objects, as well as persons, which may be likely to cause excitement, either through his affections or antipathies; and on this account, friends whose sensibilities might be strongly excited should be forbidden to approach him.

XXIX.

APOPLEXY AND PARALYSIS.

THE *simplest* definition that can be given of apoplexy is, that it is a sudden loss or suspension of the functions of animal life, those of the organic system remaining intact, or at least impaired only, but not arrested. Thus when a person falls down senseless, but not in a state of syncope, the action of the heart not being greatly impeded, he is said to be attacked with apoplexy, or for the sake of greater accuracy, with cerebral apoplexy. This definition, however, requires considerable qualification, as well as extension, since it sometimes happens that, with the functions of animal life, those of organic life are also involved, and if it be to the extent of stopping them, the patient of course dies—it is a case of sudden death; but if upon examination there be found the appearance which is supposed to constitute *κατ ἐζοχην*, apoplexy (extravasation of blood), in the cranium or spinal canal, he is said to have died of apoplexy. It happens too, almost always, that the functions which hold a middle place between animal and organic life, those, namely, of the nerves of respiration, are impeded, but not arrested. When the primary lesion is in the brain, the automatic or reflex motions in the extremities are not impaired, since the true spinal system is uninjured, and, accordingly, the lower extremities will be drawn up when the soles of the feet are irritated; but it may happen also that there will be sudden loss of power (though the case is rare) of some of the extremities, as of the legs, for instance, and with it the loss of the reflex or automatic motion; although at the same time the sensorial functions may be unimpaired. In this case the primary mischief is in the spinal canal, and the patient is said to have spinal apoplexy.

Perhaps the *most correct* definition of apoplexy in general would be, that it is a sudden loss of function sustained by some portion of the brain or spinal cord. This again is liable to being misunderstood, owing to a vagueness attached to the term apoplexy; for instance, when a person suddenly loses the power of one extremity or one side, he is said to have an attack of sudden paralysis or loss of power, but this is not *commonly* called apoplexy, unless it be found, or there be strong reason for believing, that there is extravasation of blood; whereas, the sudden paralysis or loss of power may depend upon a variety of conditions of the nervous matter, of which extravasation of blood into its substance, or upon its surface, is only one. We see then that the obscurity, which necessarily attaches to the pathology of the sudden and dangerous disease which is commonly known as apoplexy, is further increased by the word commonly employed to designate it not always being used in the same sense, a difficulty rendered still greater by its unfortunate adoption into the pathology of another region of the body by the phrase pulmonary apoplexy, to express extravasation into the tissue of the lung.

Apoplexy makes its attack in different ways; and Dr. Abercrombie has described three different modes of its invasion, in which he has been followed by Dr. Watson; and although every particular case may not in all things agree with any one of the three, it will almost invariably do so in its more prominent features, so that the bearing these distinctions in mind will contribute much to a clearer apprehension of this most difficult part of our subject.

In the first form of the attack the patient falls down suddenly in a state of profound coma, " his face is generally flushed, his pulse full and not frequent, sometimes below the natural standard. In some of these cases convulsions occur, in others rigidity and contraction of the muscles of the limbs on one side only."

Of persons so attacked, some die in a short time, and a large quantity of blood is found extravasated; others die after a longer period, and serous effusion only, and of no great amount, is found; and in some that die early, no effusion of either blood or serum. Others recover altogether, and no ill effects remain; others again recover from the coma, but remain paralyzed upon one side, or as it is termed hemiplegic, or with defect of the power of speech, or of one of the senses. The paralysis may disappear after a few days, or it may continue for months, or years, or for life.

If we endeavour to analyze this class of cases of apoplexy, which have been distinguished by Dr. Abercrombie as the *primarily apoplectic*, we shall perceive that they consist of a sudden loss of the functions of animal life; we have a sudden or very rapid loss of the powers of the brain, and death, when it takes place, is by coma, or death from the brain. This may be caused by rapid effusion of blood pressing upon the brain and destroying its powers. In other cases, again, we have the same symptoms, but death after a longer interval, the coma becoming more and more profound; and in these cases a small amount of fluid only is found effused, upon the surface of the brain, or into the ventricles. This effusion, as such, is not sufficient in most cases to cause death, but in the majority of instances it is not probably the quantity of effusion, but its quality that is connected with the invasion of the coma. The serum contains urea, whence it is to be inferred that the same principle is circulating in vessels of the brain as well as throughout the system, owing to uræmic poisoning from disease of the kidneys.

Of the cases which recover from the coma some are permanently paralyzed; and there can be little doubt that in these there is permanent injury inflicted on the nervous matter by the extravasation of blood from rupture of a blood-vessel. But here it will be well to call to mind that this rupture is in most instances the effect of disease of the vessel, and that the vessels of the brain are more liable to disease than those of almost any other part of the system; and further, that such disease will often be, of itself, sufficient to produce sudden loss of power of that portion of the nervous matter through which the vessels ramify; that is to say, that disease of the cerebral arteries (generally in the form of thickening of the tunics with deposit of oil globules, semi-cartilaginous matter, and sometimes calcareous matter) may by simple disturbance of the circulation, produce a loss of consciousness or of power, that is to say coma or paralysis, according to the extent and situation of the nervous substance involved. It will generally happen, however, that when there is no further lesion the coma or paralysis will pass off, and the patient recover for a time at least.

But we have still another source of obscurity and difficulty: these very lesions of the arteries, which give rise to secondary lesion in the brain, are themselves often the result of an antecedent one, which may of itself produce similar disturbance of the functions of the brain directly, and without the intervention of the disease of the arteries; since one effect of the uræmic poisoning from disease of the kidneys, or otherwise, is sudden coma; but disease of the arteries generally, and more especially those of the brain, is among the most common effects of uræmic poisoning. So that we may have two causes coexisting, either of which may be sufficient to produce apoplectic symptoms, both of which may have a common antecedent cause, but of which one—the disease of the arteries, may be the effect of the other—the uræmic poisoning.

There remains, however, another anatomical condition in which the apoplectic symptoms require to be accounted for, and that is apoplexy without any appreciable structural change whatever, the cases of simple apoplexy of Dr. Abercrombie; but when we bear in mind what has been stated of the possibility of apoplectic symptoms being induced by diminished supply of blood, through disease of the arteries, and the probability too of this being overlooked in post-mortem examination; and when we take into account the attacks from direct uræmic poisoning, of which cause of cerebral disorder Dr. Abercrombie could have taken but little account, we no doubt greatly diminish the number of cases of simple apoplexy.

If we endeavour to analyze the causes of apoplexy, we find the immediate ones to consist of extravasation of blood into the substance of the brain, upon its surface, or into the ventricles; pressure upon, or compression of, the substance of the brain, by determination of blood, or an undue quantity sent to that organ; disease of the arteries, generally of a large branch, intercepting or diminishing the supply of arterial blood to a large portion of one hemisphere, often producing or attended by softening of some portion of the nervous substance from impaired nutrition; poisoning of the blood circulating in the brain, by retained secretion, as in the case of uræmia; and as a doubtful cause we may add, simple loss of power by the brain, or a portion of it, constituting the true simple apoplexy of Abercrombie; but we regard this cause as doubtful, since it is difficult to find unexceptionable instances from which all the other causes have been eliminated.

If we still further pursue the train of causation, we find that as the extravasation must have proceeded from ruptured vessels, so this rupture may have arisen in one of two ways—either the vessels may have been subjected to an unusual amount of distension, or, in other words, the blood may have been too forcibly injected into them, or the vessels themselves may have been diseased. In the case of distension, again, there is room for difference in the causes. 1. The injecting force of the left ventricle may have been excessive. This may, no doubt, arise from hypertrophy of the left ventricle; but there can be little doubt that too much importance is attached to this as a direct cause of sanguineous apoplexy, however frequently the two lesions may have been found to coexist. The truth being, as we have elsewhere pointed out, that hypertrophy is generally the result of a conservative effort, either, to compensate for the mechanical disadvantage of dilatation, in which case there can be no increase in the force of the systole, or to counterbalance the obstruction produced by disease of the valves or arteries. In the case of valvular obstruction the force of the systole indeed may be increased, but it is so only in proportion to the obstruction, and there is no increase in the force of the jet. In the case of regurgitation through the aortic valves, or of disease of the large arteries, the conditions are different; for, as has been elsewhere pointed out, the blood passes along them in jets rather than in a continuous stream, as may be perceived at the wrist by the so-called water-hammer, or splashing pulse, and each jet is more forcible in proportion as the continuity of the current is destroyed; and in such case a greater degree of violence is sustained by some of the remoter arteries than they are normally exposed to, and the result may be laceration. 2. On the other hand, we may have a delay in the return of the blood through the veins, arising from obstruction in the pulmonic circulation, whether produced by diseases of the mitral valve, or the lungs, or air passages, especially the latter, as in the case of chronic bronchitis; but in such cases the obstructed circulation through the veins, though it must in time be propagated to the arteries, and does in some instances give rise to laceration and extravasation, yet when it is the cause of apoplexy, it is so more commonly by means of pressure from engorgement of the vessels of the brain.

Again, we may have disease of the arteries themselves: this may arise from several causes, the chief of which are—advanced life, leading to ossific deposits, rigidity and lacerability of the arteries generally, but more particularly those of the brain; hard labour, which produces a nearly similar effect; intemperance, and disease of the depurating organs, but more especially of the kidneys; though the last-mentioned cause, namely, renal disease, may be the effect of the previous one, intemperance. Another form of disease of the cerebral arteries is aneurism, most often of the large, but sometimes of small branches, which may be seen without any great amount of disease in the arteries generally.

The next cause of apoplexy, namely, sanguineous engorgement, is one the existence of which was for a long time denied by British pathologists; but the experiments of Dr. Burrows satisfactorily show that the arguments used to prove its impossibility are altogether inconclusive. In connection with this cause of apoplexy we may notice the frequently adduced one of serous effusion, constituting the serous apoplexy of some authors. It is, however, far from certain, and it is contrary to the analogy of the other serous membranes to believe, that the serum can be poured out with sufficient rapidity to produce apoplectic coma, independently of previous engorgement or uræmic poisoning, either of which is sufficient to account for the attack.

A common cause of this engorgement of the brain has been pointed out above—namely, obstruction to the return of the blood to the right heart, either caused by disease of that organ, or dyspnœa from disease of the lungs or air passages; but there can be little doubt that it may arise primarily, upon the principle of the old adage—"*ubi stimulus ibi fluxus*," whether that stimulus be primary as regards the brain, as from mental emotion, or, it may be, gouty hyperæmia—or secondary, from irritation elsewhere, as in the case of the stomach, through the medium of the pneumogastric nerve. Disease of the arteries, intercepting the supply of blood to any considerable portion of the brain, is another cause; that by this means the functions of a considerable portion of the brain are suspended is evident from many cases in which there has been sudden paralysis of the extremity which corresponds to the portion of the brain so affected, and the fact has been most ingeniously and elaborately established by Dr. Norman Chevers; but here we meet with an instance of the necessity for the most scrupulous care in endeavouring to trace the causation of the attack, since disease of the arteries may arise from uræmia, which may of itself produce apoplexy, and render the vessels more liable to rupture—another cause of apoplexy. But there is still another cause, and that is softening of the brain, which may be the secondary effect of diseased arteries. It is true that this affection more commonly induces gradual paralysis than a sudden attack of apoplexy; but there can be little doubt that it sometimes induces the latter, when situated in the central parts of the brain. Softening may take place, as we have seen, from active inflammation, which is, however, generally accompanied by symptoms of that affection, and is then of the character of the red or yellow softening; but it sometimes, though very rarely, presents itself in the form of the white or non-inflammatory softening, as a primary lesion.

The last cause of apoplexy, or apoplectic coma, which we have to notice is poisoned blood circulating in the brain: of this the most notable and frequent instance is that of which we have before spoken under the term uræmia. And next, if not equal to that in importance, is blood overcharged with carbon, which state may be either the direct effect of dyspnœa from pulmonic disease, or it may be a secondary effect of disease of the brain, paralyzing the muscles concerned in respiration. But the same symptoms may arise from poisons introduced into the system by the mouth, as in the case of ordinary drunkenness, though the latter cases are not commonly regarded as apoplexy.

We find then that there are a variety of causes which may induce apoplexy, widely differing as to the anatomical changes with which they are found associated. But we believe that they all resolve themselves into pressure, deficiency of supply of blood, solution of continuity, and poisoned blood.

In regard to pressure it may be asked whether extravasation ever causes sufficient pressure to induce apoplexy. Dr. Burrows gives some very good grounds for believing that it does not; but that the apoplectic coma and the extravasation are the joint effects of a common cause, namely, hyperæmia. And there can be little doubt that in by far the greater number of cases of extravasation, his reasoning is conclusive—that the extravasation, though it causes paralysis, does not produce apoplectic coma; but in the second class of cases of Dr. Abercrombie, the cases not primarily apoplectic, it is difficult to account for the phenomena upon any other hypothesis than that which has been given, the quantity of blood extravasated becoming at length so great as to produce pressure upon the nervous fibres sufficient to induce apoplectic coma. The extravasation, too, by producing laceration and division of the nervous substance, induces a suspension of the functions of the brain, which, when it involves the nerves of respiration, must amount to coma.

It may perhaps be asked how it can happen that a person with a chronic disorder like that form of Bright's kidney, which is very apt to lead to coma, should so suddenly manifest the effects of a poison which must have been circulating in the system for a considerable time? To this we can only reply, that the urea seems to be a cumulative poison, and that there is no more difficulty in believing the sudden effect of such a poison upon the brain, than that of digitalis, which may have been taken for a considerable time, upon the heart.

But after deducting these cases, there still remain others in which there is satisfactory evidence that no such condition either of the blood or vessels has existed, and that many of these are to be explained by pressure from increased determination of blood to the brain there can be no doubt, although some have denied the physical possibility of such a condition. Dr. Burrows has, however, not only shown that it is possible for the cranium to contain a greater quantity of blood at one time than another, but has proved it by experiment.

Whether after all these deductions we have still to admit the occurrence of apoplexy from simple functional loss of power by the brain, independently of any of the above causes, may still be considered doubtful; its theoretical possibility may be admitted, but its actual occurrence is, to say the least, "not proven."

The second class of cases of Dr. Abercrombie are those which he described as *not primarily* apoplectic—the coma not being the earliest symptom. The disease commences with sudden pain in the head—there is faintness, sickness, pallor, and the signs of syncope; the patient does not always fall, and commonly recovers in a short time from all giddiness and confusion, but does not lose the pains in the head. After a certain time, varying from a few minutes to several hours, he becomes very forgetful, confused, and gradually sinks into coma, from which he rarely ever recovers; sometimes in such cases there is paralysis, and now and then convulsion of one side, but more often there is neither. The cases of this class are more certainly fatal than the more sudden primarily apoplectic ones. Upon a consideration of the symptoms we may perceive that they are to be explained by the rupture of a vessel, which gives a shock to the system, from which it in a short time recovers; but in the meanwhile blood is steadily escaping from the ruptured vessel, which by its increasing pressure gradually destroys the functions of the brain, and we have death from coma. In some cases in which there has been a considerable interval between the recovery from the first shock and the invasion of the comatose symptoms, it has been conjectured by Dr. Abercrombie, and with good reason, that a clot has formed upon the orifice of the open vessel, which has checked the hæmorrhage for a time, and thereby arrested the progress of the disease, but by the removal of the clot the hæmorrhage has recurred, and the pressure and consequent coma have advanced.

In the third class of cases, the *paralytic*—the symptoms resembling those of the "*primarily apoplectic*" as regards their suddenness, but differing in respect to their not involving the consciousness—there is no coma. In the subsequent progress of these cases there is considerable difference; in some the disease passes more or less quickly into apoplexy; and in some, on the other hand, the patient gradually recovers the use of the paralyzed muscles; others again remain permanently paralyzed for the remainder of life; bereft, it may be, of the use of one side, or with one leg or one arm paralyzed, or imperfect speech, or loss of vision of one eye from amaurosis, or dropping of one eyelid (ptosis). When these cases prove fatal, the appearances after death are, as in the primarily apoplectic, inconstant; and it is no more than we might expect that they should be so, the pathology of the two classes of cases being essentially the same, the difference being in the extent or part of the organ affected.

Besides the immediate causes of apoplexy which have been mentioned above, there are several conditions which render any person liable to apoplectic attacks, some of which may be, indeed, said to be the immediate cause of the disease; among the first of these we may reckon hereditary predisposition. The recurrence of apoplexy in families is an observation too well attested to require to be insisted upon. Age is a most important agent in the production of apoplexy. It is true we sometimes meet with apoplexy in young persons, but after fifty the liability to it greatly increases, and a greater number of cases occur between the ages of fifty and sixty than in any other decennial period of human life. It is not, however, to be inferred from this that the liability to the disease diminishes after sixty, but only that the absolute number of persons living decreases; and if this be taken into the account it is found that the proportion of those who die of apoplexy between sixty and seventy is still greater than in the preceding decennial period, and the same of ages still more advanced. The results of statistical inquiries appear to be that the liability to apoplexy increases as age advances, but that about fifty it undergoes a considerable increase. Whether the apoplexies in advanced life are generally those from disease of the arteries or from simple engorgement has not been estimated by any author; but it is probable that the former affection increases with increasing age, and with it, as a necessary consequence, the tendency to apoplexy and paralysis. The gouty diathesis is another predisposing condition; natural configuration and temperament is another; persons of a plethoric habit, corpulent, and with short necks, are more prone than others to this disease; but the most spare are not exempt from it. Here again we most likely meet with differences in the kind of apoplexy, that is to say, in its immediate cause, as it is probable that the apoplexy of the short-necked and plethoric is that of congestion (generally venous), while the apoplexy of the spare is that of diseased arteries. Diseases of the heart and respiratory organs, again, have been pointed out as predisposing to apoplexy; and, according to the arguments already adduced, it is probable that the apoplexy from disease of the mitral valve—of the right heart,—or that from pulmonic obstruction, from whatever cause arising, is the apoplexy of engorgement; whereas that of aortic disease is the apoplexy of extravasation or other lesion of arteries; and there is probably a considerable difference as regards the state of the circulation through the brain, as well as in other parts of the body, between disease of the aortic orifice, and that of the mitral valve with the cognate condition, which difference we have already pointed out (pp. 350 *et seq.*).

In connection with heart disease as a cause of apoplexy, we may here point out the sudden suspension of the functions of a portion of the brain by a plug of fibrine obstructing the artery supplying that part. The attention of the profession was first directed to the possibility of such an occurrence by Dr. Kirkes; and its probability has been also shown by Dr. Burrows. These plugs are supposed to be fibrinous concretions, which having formed upon the surfaces of the valves or upon any portion of the endocardium during an attack of endocarditis, and having become detached, are carried along with the arterial current, until being cast into an artery, the calibre of which is not sufficient to allow of its further progress, it is there stopped, and in its turn stops the further progress of the blood, and often suspends the functions of the part supplied by the artery. These coagula or plugs have, from the mode of their injection, received the name of emboli ; and when one of them is carried into a large cerebral artery it generally causes apoplexy or paralysis, or both, but more commonly the latter.

Another predisposing condition, or perhaps we should rather say the most frequent of all the primary causes of apoplexy, is Bright's kidney. The series of causation, indeed, by which this disease produces apoplexy may be various ; either it may ensue directly from the non-depurated blood, or through the heart disease, of which the renal affection is a most productive cause, or through the arteries, which are also very prone to become affected from the same source.

The *diagnosis* of apoplexy as such is not difficult ; the only diseases with which it is liable to be confounded are epilepsy and intoxication either by alcohol or opium. From the former it may be distinguished by the absence of the convulsions or other characteristic signs of epilepsy to be hereafter described. From intoxication the diagnosis is not always so easy, since profound intoxication is a species of apoplexy ; the previous history will in most cases enable us to recognize the former, which for our credit's sake, as well as the safety of the patient, it is most important that we should not set down as apoplexy : when, therefore, a man is found in a condition supposed to be apoplectic, and can give no account of himself, we must observe carefully if there be any smell of alcohol or opium in the breath. It is to be remembered, too, that either alcohol or opium might induce apoplexy, but it would be safer, especially in the case of alcohol, to wait for its development ; and in a doubtful case the use of the stomach-pump would probably bring to light the true state of the case.

The diagnosis of the true nature of the disease, or, in other words, of the cerebral lesion upon which the apoplectic attack depends, requires much more consideration ; and as upon it must depend the treatment to be pursued we shall consider the two subjects together.

There has been no more prevalent or dangerous error, or any which has more slowly yielded to the increased accuracy of modern pathology, than, that all cases of apoplexy are to be met with active depletion and other powerful antiphlogistic measures ; whereas, from what we have seen, the apoplectic seizure may arise from such very different causes, and be connected with such very different conditions of the system, that it is obvious that the same remedies cannot be applicable to all. Let us first take as an instance an attack of the primarily apoplectic kind, which, from the suddenness of its invasion and the imminent danger of the patient, appears to require the most prompt treatment. Those cases which strictly agree with the description of Dr. Abercrombie quoted above, in which the face is flushed and the pulse full and strong, are cases of active congestion of the brain, generally with a strong left ventricle of the heart, arising either from that cause or simple increased determination of blood to the brain, aggravated probably by some unusual mental excitement, or the stimulus of excessive repletion. In such cases prompt and active depletion is the most appropriate remedy. A vein should be immediately opened and blood be allowed to flow until a decided impression is produced upon the pulse. The bowels should also be freely acted upon with the least possible delay. For this purpose, when there is no very great difficulty in swallowing, a full dose of calomel, say ten grains, should be administered, which will best be effected by mixing it with a little sugar and butter, and placing it far back upon the tongue of the patient; but if he appear totally unable to swallow, which may be ascertained by introducing a teaspoonful of liquid into the mouth, it will be better not to attempt to give the calomel, since it is apt to be rolled about in the mouth, and by producing soreness may increase the difficulty of deglutition without any adequate benefit. Under such circumstances about two drops of croton oil should be placed on the tongue, and in either case a purgative enema should be administered (F. 89 .* But it very often happens that we do not find the concurrence of the above symptoms; full and strong pulse and the flushed face may be one, or both of them, wanting, in which case the apoplectic seizure may arise either from failure of the circulation from a feeble heart, or from diseased arteries, or from pulmonic obstruction, or uræmia. Under such circumstances, the advice of Dr. Watson, adopted too by Dr. Burrows, is highly judicious. "If the pulse be full, or hard, or thrilling, or if there be obvious external signs of plethora about the head, you must abstract blood. You are not to refrain from bleeding the apoplectic patient because he is pale if the pulse warrants it, nor may you omit taking blood if the face be turgid, although the pulse be small, for that smallness may depend upon organic disease of the heart. On the contrary, if the skin is pale and cold and the pulse flickering, you would probably insure your patient's death if you withdrew from the failing heart and blood-vessels a portion of their natural stimulus." Though even these directions must be received with some qualification, since there may be other causes besides disease of the heart, of which the chief are diseased cerebral arteries and uraemia, which may produce apoplexy, in which case *large* bleedings, or even general bleeding at all, would not be expedient. The safer, and we might add, the more effective remedy, in such an instance, would be to cup the patient at the nape of the neck to six or eight ounces.

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* (89) ℞ Pulv. Jalapæ, ʒ j.
Infus. Sennæ co. (callidi) ℥ xii. Misce.
Ft. Enema.

We would also again direct attention to the hardness or softness of the pulse as a sign of the tolerance of bleeding; if the pulse be hard, its smallness need not deter us from moderate depletion; but we must be careful to distinguish between the hardness produced by an artery of more than average contractility resisting the injecting force of the left ventricle, and the hardness which is of the artery rather than the pulse, arising from thickening of the coats of the former, a distinction which is particularly important in cases of apoplexy, which is a disease of advanced life, and often occurring in connection with diseased arterial tunics.

In the first place, however, it is most important, as Dr. Burrows has pointed out, to examine carefully the state of the heart, to which we would add that of the large vessels. Now the state of the pulse in diseases of the brain and upper part of the spinal cord is very perplexing, and we have alluded to the influence of such as well as of cardiac affections in modifying the character of the pulse at the wrist; but when we *know* that there is cerebral disease, and *apprehend* that of the heart, the necessity for careful auscultation of the latter must be apparent. "If," says Dr. Burrows, "no cardiac disease be discovered, or if simple hypertrophy without notable valvular disease be detected, depletion, both general and local, may be carried on so far as the cerebral symptoms appear to call for that kind of relief." But we would here recur to what we have stated as to the infrequency of simple, *i. e.*, *primary* hypertrophy (p. 331). A plethoric subject with full muscular development, and using much muscular exercise, may indeed, especially after repletion, have an attack of apoplexy, and in such a case we should find all the conditions laid down by Dr. Watson as indicating depletion, which should be carried as far as the exigencies of the symptoms require, both in the way of bleeding and purging. But if we find hypertrophy of the left ventricle without such condition and without valvular disease, we must refer it to one of the causes already assigned (p. 331), and regard it merely as a compensation for some other cause obstructing or impairing the force of the ventricular systole. If that cause exist in the left ventricle itself, in the way of fatty degeneration or the effects of carditis, the compensation will barely be sufficient to counteract the obstructing cause, and we shall have practically a weak heart (which will generally be evidenced by more or less of dilatation). This will also appear in the feebleness of the pulse at the wrist.

and still more in that of the pulsation of the carotids, which ought always to be most carefully explored.

But, as we have pointed out, one very common cause of hypertrophy is disease, in the form of thickening, of the tunics of the remoter branches of the arterial system; and such a state of things is very likely to be associated with apoplexy, if not to lead to it, and perhaps these cases constitute the greater number of those included in the term simple apoplexy. This cause of hypertrophy may generally be detected by the signs we have already given, especially by the tortuous and rigid radial or temporal artery, and by any evidence we may have of the existence of one of its frequent causes—visceral disease, hard labour, hard living, and advanced age. Are we to bleed in such cases? Now here we may have—active congestion, attended or not by rupture of a vessel,—or a narrowed or diseased artery, obstructing the supply of blood; we, in fact, may have one of two opposite conditions. In the case of congestion we shall generally have the heart acting strongly and the pulse of considerable force, after making allowance for the thickened arterial tunics. Under such circumstances we believe that, except in very advanced life, we may bleed moderately, more especially as in this condition of the system bleeding is generally well borne; and even if there be renal disease, which is not unlikely, it will not render the patient less able to bear one free venesection. But if we find hypertrophy with a feeble pulse, and still more, if the pulsations of the carotids are not strong, even though there may be no valvular disease, it is probable that there is some obstruction to the circulation which the hypertrophy is hardly sufficient to counteract, or that the hypertrophy is of the right ventricle, in neither of which cases is venesection expedient; and where there is reason to apprehend disease of a large artery of an obstructive character, diminishing the momentum of the blood throughout a considerable portion of the brain, depletion would be most mischievous. In cases of apoplexy from diseased arteries, there is generally pallor, probably from the patient being commonly of advanced age, and also from its frequent connection with renal disease: but if the pulse be full and but little compressible (and in saying this we must repeat the distinction between a hard artery from thickened tunics and a firm pulse from a forcibly acting left ventricle with perfect valves, we may venture to bleed provided the extreme age of the patient do not contraindicate it; but if the pulse be compressible we should do wrong, although we may have evidence by auscultation of hypertrophy; still more, as in the absence of valvular disease, and with a small pulse, it would be more than doubtful that the hypertrophy was of the left ventricle.

As regards well-marked disease of the *large* arteries, we would lay it down as a rule that venesection should never be resorted to; but if there be considerable arterial action, cupping may be employed between the shoulders; but even this remedy must be employed with caution, since these are the cases in which we are most likely to have anæmia of a portion of the brain from obstructive arterial disease. In such cases, however, we shall almost always have hemiplegia.

If there be regurgitation through the aortic valves, the thrilling pulse and forcible impulse of the heart, which will be generally hypertrophied, as well as dilated, should never tempt us to abstract blood by venesection; and if there be only obstruction in these valves without regurgitation, the same rule applies, since though there will probably be hypertrophy, this hypertrophy will not be more than sufficient to overcome the obstruction; in neither case, however, does apoplexy occur so much, as the direct result of the hypertrophy, as from the obstruction being propagated through the lungs to the right side of the heart, and bringing the circulation to the condition in which it is when there is disease of the mitral valve: in which case the pulse, as we have before pointed out, is too feeble or irregular to suggest the idea of venesection; so that all the forms of valvular disease ordinarily met with, fall into the same category as regards the state of the cerebral circulation, and this last is similar to that produced by emphysema of the lungs, or dilatation of the tubes from chronic bronchitis; the similarity of which latter affection, as regards the circulation, to that produced by disease of the mitral valve we before pointed out (p. 353). In all these cases there will be evidence of extreme congestion, with forcible action of the heart: but a knowledge of the mechanical disadvantage at which that organ is acting, should deter us from venesection, though great relief will often be afforded by the free local abstraction of blood, by cupping either between the shoulders, under the left mamma, or at the scrobiculus cordis.

In all these cases, too, as we pointed out in disease of the heart producing venous congestion, much relief will be obtained by the free use of purgatives. Diuretics of a somewhat stimulating character will be found valuable adjuncts to the treatment, more particularly as pointed out by Dr. Burrows, in cases proceeding from pulmonic obstruction: in those where the circulation is feeble, the purgatives also should be of a somewhat stimulating character (F. 90),* and the enema should contain about an ounce of oil of turpentine. A blister should also be applied to the nape of the neck, and this, too, should be done in those cases where even local depletion is not admissible. When there is dilatation of the chambers of the heart, or the circulation is very feeble, and the patient anæmic, we must not be deterred by the name of the disease from the use of stimulants, either in the form of ammonia, or it may be wine or brandy, especially if the extremities are cold and clammy, and the skin bedewed with perspiration; and these may often be required immediately after local depletion, in cases where the latter has been deemed necessary from the signs of excessive congestion. But the primary apoplectic cases include those in which there supervenes a sudden profound stupor, sometimes with convulsion, but more commonly without; in which there is no evident paralysis, and in which there is reason, either from examination of the urine, or from other sources of information, to believe that there is albuminuria: when this is the case, and the coma is the direct effect of the urea upon the brain, as shown by the character of the stupor and the absence of any of the other lesions which we have pointed out as inducing apoplexy, venesection is not indicated for the relief of the disease as such, but if there be increased arterial action, especially in the carotids, blood may be taken; it is, however, generally better to do so by cupping than by opening a vein; though if there be much hypertrophy of the left side of the heart, the latter is admissible. The bowels must also be promptly acted upon, both by purgatives by the mouth and by enemata; for the former purpose not more than a single dose of calomel of about five grains is allowable, and that should not be repeated, on account of the great susceptibility of the system to the action of that mineral.

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* (90) ℞ Pulv. Rhei, gr. x.
Decoct. Aloes co. ℥ ss.
Infus. Sennæ co. ℥ j. Misce.
Ft. Haust. 3^{ia} vel 4^{ta} quàq. horâ sumend.

The second class of cases (those not primarily apoplectic) may generally be recognized by the peculiar mode of invasion of the disease; and here unfortunately we can do but little, as the prognosis is in the highest degree unfavourable, the sudden pain generally indicating that a vessel of some size has given way in the brain, or on its surface, and the subsequent coma is the result of the pressure produced upon that organ. These are generally cases of disease of the arteries of the brain, and the question arises as to whether the coma is due directly to the pressure of the effused blood, or mediately to an anæmic condition of the brain which that pressure must tend to produce. In the former case, it is desirable to diminish as much as possible the force of the heart's action; in the latter, the abstraction of blood would be injurious. The best guides under these circumstances are—the force of the heart's action, carefully distinguishing between the stronger impulse with a rather deep sound, of a hypertrophic ventricle, and the heaving beat with clear sound of a dilated one;—the pulse at the wrist, taking especial notice of its being firm, perhaps slow, or on the other hand compressible and "splashing;"—the countenance whether congested or pallid. Of these perhaps the most important is the pulse, and if that be of the latter character, the depletion ought on no account to be had recourse to. If the patient be seen early, and the signs of oppression with strong cardiac action exist, the attempt should be made to check the mischief by venesection, carefully watching its effects upon the pulse. In the more intermediate condition, when the pulse is still firm, and the countenance turgid, blood may be taken from the nape of the neck by cupping, but where there is the hæmorrhagic pulse and pale countenance, we should rather have recourse to gentle stimulants.

The treatment of the third class, or paralytic cases, must be regulated upon the same principles as those of the first, with the exception that, as we have not in the first instance to contend with the coma, there will not therefore be such urgent necessity for depletion; but we must be guided in its use by the same rules as in the primarily apoplectic cases, with the additional reason against venesection that in the case of hyperæmia, it has been already followed by extravasation, and therefore one great reason for the use of the lancet will have been removed; when therefore there are indications for the abstraction of blood in the condition of the heart, the pulse, or the countenance, or when there is pain in the head over the mastoid process, or on the temple, on the opposite side to that which is paralyzed, we should prefer cupping from the nape of the neck. A considerable proportion of the cases of sudden paralysis, especially if it is partial, affecting, for instance, only one extremity, or the tongue or muscles of one eye, depends upon obstructed circulation from disease of the arteries supplying the corresponding portions of the opposite side of the brain. To the diagnosis of this condition we may be led by the state of the temporal arteries, the age and habits of the patient, and the character of the urine. General depletion will here be scarcely ever required; but if the action of the heart be forcible, blood may be taken by cupping from the nape of the neck; and if there be signs of congestion, but with a doubtful state of the heart, considerable relief will be obtained by dry cupping. After this a blister may be applied, and a moderate dose of calomel administered (when the urine is not albuminous), and the action of the bowels kept up by purgatives of a somewhat tonic character, such as the rhubarb and compound decoction of aloes.

Sudden paralysis may sometimes ensue from softening of the brain, the suddenness of the attack depending probably upon the rapid extension of the disease, to a set of fibres influencing the voluntary power of the affected muscles. This is generally associated with the arterial disease just specified, and will present no signs of increased vascular action, but often the opposite. Under such circumstances stimulants may be carefully administered, the bowels being kept freely open, but not purged, and a blister applied to the nape of the neck, and subsequently to the side of the head opposite to that on which the paralysis exists. The paralysis may, as we have observed, be brought about by the extension of softening, but this extension may also reach the more central parts of the brain, and, by implicating the origin of the nerves of respiration, induce apoplectic coma; or the arterial disease which has led to softening may also bring on apoplexy by the giving way of one of the diseased vessels. In either case of apoplexy supervening upon paralysis, the prognosis is highly unfavourable, and the treatment must be the same, and regulated upon the same principles as that of the second class of cases.

After the 'fit,' as it is termed, of apoplexy has passed off, and more particularly in those cases where it is followed by hemiplegia, and probably attended by extravasation, inflammatory change takes place around the clot; and two or three days after the coma has subsided the patient complains of pain in the head, generally on the side opposite that which is paralyzed; the face becomes flushed, the scalp hot, the patient frowns, and sometimes squints; sometimes there is spasm of the arm or leg on the paralyzed side, the arm being often drawn firmly across the chest; these muscular efforts being, as Dr. Burrows observes, an effect of the irritation produced by the clot in the cerebral substance around it: there is, at the same time, more or less pyrexia. Under these circumstances antiphlogistic measures are called for; but they should not be of a violent character. The patient should be cupped at the back of the neck, and salines with antimonials may be employed for a time, the bowels being kept freely open; after the skin has become cooler and moist, bichloride of mercury will often be of service; a drachm of the solution may be given three times a day, and the dose increased to a drachm and a half, or two drachms. A good form for its exhibition is the well-known one of Sir A. Cooper (F. 91).[*] Counter-irritation should be at the same time used. After, however, the inflammatory symptoms have passed away and in some cases where none have existed, the paralysis continues, and sometimes the patient complains much of pain in the affected limbs; for the latter we cannot often do much, but some relief may be given by anodyne and gently-stimulating liniments. We can here do but little towards the removal of the primary lesion; yet where the paralysis is not perfect, and there seems to be some return of power, though it may take place slowly, we may help the progress of the patient by nervine tonics, of which the safest and most efficient is the sulphate of zinc, which may be given in doses, beginning with a grain, increased to four or five, three times a day.

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[*] (91) ℞ Liq. Hydr. Bichlorid. ℥ ss.
Tinct. Rhei.
Tinct. Cinchonæ, āā ʒ ij. Misce.
Sumatur ʒ j.—iij. ex quovis vehiculo idoneo.

We have already alluded to apoplexy of the spinal marrow; that is to say,—sudden abolition of its proper functions. This may sometimes arise from spinal *hæmorrhage*, the symptoms of which are sudden pain in some part of the spinal cord, convulsions and paralysis of those parts below the seat of the injury. Such cases are very rare: at least as observed by the morbid anatomist, the cases which he records being the fatal ones; but it is not improbable that slight extravasations do occasionally take place, and produce paralysis, which is recovered from.

This paralysis of the lower extremities, commonly known by the term *paraplegia*, may however arise from other causes, some of which are very obscure. The functions of the spinal cord may, besides extravasation, be arrested by softening, whether inflammatory or otherwise, by effusions or thickening, arising from inflammation of the membranes, or by pressure from tumours, or disease, or displacement of the vertebræ; but in many cases there can be found no lesion to account for the paralysis, and we are driven to the conclusion that there is such a thing as loss of nervous power without any change in the nervous matter which we are at present able to detect. In some cases the palsy comes on rather suddenly; the patient complains perhaps for a time of pains in some part of the spinal column, and then has suddenly an increase of this pain, with loss of power of the lower extremities. In the majority of cases, however, the disease creeps on far more insidiously; there is a feeling of diminished power and increased weight in the legs, which are apt to become colder than in health; there is tingling and numbness of the toes and feet, and a feeling of irritation as if by ants, which has received the name of formication: the difficulty of walking increases, and ultimately the patient loses altogether the power of doing so. The paralysis gradually extends in this way from below upwards, affects the bladder and rectum, and ultimately some of the organs still more essential to the maintenance of life, the patient sometimes dying of apnœa from paralysis of the muscles of respiration. In some of these cases no structural changes can be found in either the brain or spinal cord; when such changes do exist the commonest is softening.

In the majority of instances the seat of the disease would appear to be rather in the brain and its prolongation into the spinal canal than in the true spinal marrow itself; since when

the voluntary power is almost entirely annihi
or excito-motory functions evince even a mo
amount of susceptibility, the legs being often
when the feet have been irritated: this
formerly led to the belief that patients wer
having been assumed that if a person withdrew the foot from being tickled or pricked, and sometimes from even harsher irritation, he could move it at other times if he would.

The lesion upon which paraplegia depends may be, as we have seen, various, and in some cases there is no appreciable structural change whatever, the disease being, in the strictest sense of the word, *nervine*, or depending upon failure of that power of which the nervous matter as regards its physical constitution is the vehicle rather than the cause. In some instances, independently of those in which the disease originates in the nervous centres themselves, the loss of power is produced through injury inflicted directly upon the extremities of the motor nerves, as by exposure to cold. Attacks of paraplegia sometimes come on after a person has left a warm room, and gone out upon cold ground with the feet and legs thinly covered, or when he has been long sitting or standing with the legs and feet cold and wet; sometimes severe injury to the extremities of the nerves, probably of the sentient ones, has resulted in structural changes of the nervous centres, and subsequent paralysis, as happened in a case which occurred to the author in Guy's Hospital. Coexisting gastric irritation has by some been thought a sufficient cause of paralysis of the lower extremities, and probably such is sometimes the case in children. The same has been said of disease of the kidneys, and certainly cases do occur of paraplegia coincident with strumous disorganization of those organs. It must be remembered that in most cases of paraplegia the urine is alkaline, though there is some obscurity as to the cause, in such instances. Probably, however, this alkalinity has its being in a conservative effort of nature, large quantities of mucus (which is always alkaline) being formed to protect the bladder from irritation by the retained urine. In such cases, too, the bladder presents all the appearances produced by chronic inflammation.

Besides the above there are other forms of partial paralysis of the nerves, both of sensation and motion. The latter form of paralysis is called *anæsthesia*, from ἀ privative and αισθάνομαι, 'I perceive.' These varieties of paralysis are in the highest degree interesting, to the physiologist as well as to the pathologist, since the discovery of the part of the nervous substance in which disease has been found in the case of partial paralysis has done much towards explaining the functions of that most important system in the body. It is not much assistance, unfortunately, that we can as yet gain from hence as regards our treatment, since, although the knowledge of the seat of any lesion in the brain or spinal marrow may materially influence our prognosis, it would guide us but little in the selection of remedies. As regards affections of sensation, we may, as a general rule, adopt a principle analogous to that which applies, to a great extent, to those of motion, namely, that increased or perverted function implies irritation or excitement of the nervous substance, whereas suspended function indicates pressure upon it or its destruction. Thus increased sensation is a sign of irritation or inflammation, loss of sensation of pressure or disorganization. The association of impaired or perverted sensation, with similar lesion of the power of motion, either in the same or different parts, may often guide us to a reasonable conjecture as to the seat of the central mischief, and possibly throw some light upon its nature. Thus, a man who had been much exposed to cold in his occupation as master of a steam-tug on the Thames, was brought into Guy's Hospital suffering from paralysis of rather an anomalous description. It appeared that when young he had occasionally suffered from a sanious discharge from the right ear. He, a few weeks before his admission, lost the power of motion of the right side, from the shoulder downwards, though the sensation was perfect; but what was remarkable, he had perfect anæsthesia on the opposite side. This case, which at first appeared somewhat perplexing, now admits of explanation, since, according to the interesting discovery of Dr. Brown Sequard, that the conductors of sensitive impression from the various parts of the trunk and limbs, make their decussation in the spinal, and not the encephalon, as used to be supposed; so that if the spinal axis had been injured on the right side just below the medulla oblongata, the power of motion on that side would be cut off, but sensation would remain, whereas, owing to the mode of the decussation of the conductors of sensation, the feeling upon the opposite side would be destroyed.

This man was accordingly treated upon the hypothesis that there was disease about the ligaments and possibly bones at the base of the skull and upper cervical spine; the head kept still by pillows and pads, and moderate doses of iodide of potassium were administered. He eventually left the hospital and returned to his duties.

In the treatment of paraplegia we must, in a great measure, be guided by the nature of the primary lesion as far as we are enabled to detect it. In those cases in which the paraplegia has followed closely upon symptoms of inflammation of the cord and its membranes, we must employ local depletion, and antiphlogistic regimen, and a gentle mercurial course, though the latter should be used with extreme caution when we suspect that there may be softening of a non-inflammatory character. Those cases, again, which are consequent upon exposure to cold are commonly of an inflammatory character, the immediate cause being often the pressure from effusion of fluid within the spinal canal, which effusion may have originated there, or have descended from the cranium. In the cases of which we are speaking the former is most probably the case, and here the abstraction of a small amount of blood, followed by counter-irritation along the course of the spine, with a gentle mercurial course, should be first employed. A good form for the mercurial will be the Pil. hydrarg.; or if the bowels are not sluggish, the combination of hydr. cum cret. and pulv. ipecac. co., and subsequently iodide of potassium. When the debility continues, the sulphate of zinc may be used, as in the former cases. Those which come on more gradually, and appear to depend sometimes upon adynamic softening, and at others seem to be unconnected with any structural change whatever, are even still less amenable to remedies than the preceding: where, however, the structural lesion may have originated in inflammatory action or even excitement, the bichloride of mercury may be used in the form already recommended. Subsequently tonics should be used, of which the best is the zinc, which may be pushed to doses of ten or twelve grains three times a day; or the syrup of the iodide may be employed, commencing in doses of half a drachm, and increased to a drachm and a half, or two drachms. In all these cases the bladder must be carefully attended to. Sometimes there is incontinence of urine, but at others retention; and as we have before pointed out, the bladder is apt to become inflamed and irritated by the retained secretion, and, what is more, the pelves of the kidneys distended, leading sometimes to disorganization of these organs, or to a suppression of their functions, which tends greatly to aggravate any pre-existing nervine disease. The urine should therefore be drawn off at least twice in the day when there is retention, and, if necessary, the bladder washed out with warm water.

In some forms of paralysis nux vomica and strychnia are valuable remedies. They may be given in the former in pills containing from half a grain to a grain and a half of the extract three times a day; the strychnia should be given in solution according to (F. 56, p. 398). It should be observed, however, that they are not to be employed in those cases in which we have good reason for believing that there is inflammatory disorganization going on, since they act as stimulants to the nervous system, and would promote such disorganization if any tendency to it existed. The author can speak from his own observation of the ill effect of strychnia upon cases of this description. The same remarks apply, in a far less degree, to electricity, since there is every reason to believe, that, as ordinarily employed, its effects do not reach the nervous centres, but are confined to the nerves. Strychnia seems to be most applicable to those cases in which the disease, which has produced the lesion of the nervous centres has ceased to exist, though it may have produced organic changes, and to those, if such can be ascertained to exist, which depend upon a pure torpidity or inaction of the nervous power.

Electricity again is serviceable in those cases in which there is loss of power from lesion of the nerves of a part which does not probably involve the nervous centres. Thus, a man who had been employed as an engineer at Constantinople, and had frequently stood in water, or upon damp ground when much heated, was assisted with great difficulty into one of the wards of Guy's Hospital, having lost the power of the muscles of the legs. The motor muscles of the hip and knee joints were scarcely at all affected, but he had not the least power over the foot, the paralysis being confined to the muscles of the leg and foot, which condition had lasted for eighteen months previously to the time of his admission. He was treated with iodide of potassium and electro-magnetism, and left the hospital able to walk fairly.

Of the different forms of local paralysis, there is none more frequently met with, or of greater practical importance, than is that of one side of the face, generally known as facial paralysis, or paralysis of the portio dura, the muscles supplied by that portion of the seventh pair being generally, though not always, those which are exclusively affected: it is sometimes, too, known as Bell's paralysis, from the great physiologist Sir Charles Bell, to whose discoveries we are indebted for a knowledge of its true nature. With this facial *paralysis* we may have facial *anæsthesia*, and it is well to consider the two together, though when the latter is superadded the affection is a far more serious one.

We have before alluded to paralysis of the muscles of one side of the face as a part of hemiplegia, and whenever we meet with this form of paralysis, we must examine carefully whether either extremity or any other part is similarly affected, particularly the muscles of the head supplied by the fifth pair, such are the masseter and temporal muscles; and if we find that such is not the case, we may be able to remove much serious apprehension that may be entertained by the patient or his friends.

The facial palsy sometimes comes on very suddenly, the muscles of one side of the face becoming, as it were, powerless and sleeping, whilst those of the opposite side retain their wonted expressiveness. This want of symmetry is increased, too, by the mouth being drawn somewhat to the unaffected side. When, however, the patient speaks, or smiles, or weeps, the difference becomes still more striking, the unaffected muscles, no longer counterpoised by those which should antagonize them on the opposite side, draw the mouth still more to the unaffected side; at the same time that the contrast between sleeping or waking, or between life and death, in the visage of the same person is at once ludicrous and distressing. Fortunately, the majority of these cases are more frightful to the uninitiated than really dangerous in the estimation of the experienced, provided that the paralysis be confined to the muscles supplied by the portio-dura. The paralysis of these muscles is rendered still more apparent by desiring the patient to blow or whistle, when the muscles of the paralyzed cheek are puffed out like a foot-ball: or to close the eyes, when that of the paralyzed side remains partially open, with the pupil drawn upwards; and whilst the brow of the sound side is somewhat contracted by the action of the orbicularis oculi, that on the affected side remains smooth and undisturbed. With all this, however, the power of the temporal and masseter muscles, which are those of mastication, and supplied by the fifth nerve, remains unimpaired. Curiously differing from these cases are those of facial anæsthesia; here the fifth is the nerve involved, and the loss of sensation is in most cases perfect over one side of the face, terminating, to a nicety, at the median line, so that even the most sensitive part, as the surface of the eye, may be touched without its being felt by the patient; the sense too of taste, as well as of feeling, is lost of the half of the mouth on the affected side. All this time, however, the power of voluntary motion is unimpaired as regards the acts of speaking, breathing, expression, and the like, and the symmetry of the visage is undisturbed; but in the act of mastication the case is different. When the patient attempts to perform it the temporal and masseter muscles are found to be powerless on the side which has lost its feeling.

We have just seen in striking contrast the effects of loss of their proper functions by the two nerves mainly supplying the muscles and other textures of the face and mouth, the fifth and the portio-dura. Now the cause of this loss of function may be seated either within the cranium, or along the course of the respective nerves. When the portio-dura alone is implicated, it is probable that this cause is either in the bony canal, in the temporal bone, or in that part of the nerve which lies in front of the ear. When, on the other hand, it becomes apparent from the extent of the anæsthesia, and loss of power of the muscles of mastication, that the whole of the fifth nerve on one side is affected; it follows from the more complicated origin, as well as distribution of that nerve, that the disease must be within the cranium, and therefore the prognosis becomes much more unfavourable (unless, indeed, one branch only of the fifth be implicated).

The circumstances which may cause facial paralysis are of course exceedingly various, and it is only by careful examination of the course of the nerve that we can ascertain whether there be any tumour or other mechanical cause pressing upon the nerve and obstructing its functions, or whether the patient have received any blow or other injury which may have produced the same result. We must inquire also for any evidence of disease in the ear; but when all these causes have been eliminated, there remains the most frequent, which is exposure to a current of cold air; and when there is a history of such an occurrence, and the case is one of simple facial paralysis, we may in most cases encourage our patient with the hope of perfect recovery. When, however, there has been any thickening of the sheath or parts around the nerve, we must expect more or less permanent deformity; but even here we may give the patient the comforting assurance that this is the extent of the mischief.

When, from the history of the case, it appears that there has been a blow or exposure to cold, or other causes of inflammatory action, we must have recourse to local depletion, especially when there are the constitutional signs of inflammatory fever well marked—cupping behind the ear is to be preferred—apply fomentations to the ear, or what Dr. Watson recommends as still better, and direct a current of steam of hot water against and into the ear. Mercury should also be administered so as very slightly to touch the mouth, and afterwards, especially if there be thickening or induration, iodide of potassium should be given. When there are signs of extensive disease in the petrous portion of the temporal bone, we cannot expect much benefit from any active treatment whatever.

The cases of facial anæsthesia belong, as far as treatment is concerned, to the same class as other instances of loss of function of the nerves; such partial paralyses are, it is to be remembered, often amongst the first signs of softening of the brain, especially in persons whose nervous power has been impaired by intemperance or other excesses, fatigue of body, mental anxiety, or too great intellectual exertion. In such instances, after using gentle measures to subdue any inflammatory excitement that may exist, but not unless we have good proof that it does exist, mercury in the form of bichloride may be employed; but in cases of non-inflammatory softening, mercury, especially if it produce ptyalism, is most injurious. Iodine may, however, be employed in the form either of iodide of potassium, or iodide of zinc; but most reliance may be placed upon a full course of sulphate of zinc.

SPASMODIC DISEASES.

Hitherto we have spoken either of structural changes, producing diminution of the functions of the nervous substance, or total abolition of it; or of those instances in which this power has appeared to be suspended or destroyed, independently of any appreciable change in the nervous matter; but we have only incidentally alluded to that most remarkable condition, spasm. Spasm may be said to be the opposite of palsy; it is an excess of muscular activity, and that, too, excited in a perverted and disorderly manner.

There are two kinds of spasm, the one consisting of long-continued contraction of the affected muscles, which slowly and imperfectly relax, and then, after a time, become again contracted; this is termed *tonic* spasm. In the other, which is termed clonic spasm, the contractions are sudden, violent, and repeated, the intervening relaxation being, of course, equally sudden and repeated. In many instances, antagonizing muscles seem to be alternately affected, so that a limb is thrown into continued and forcible jactitation, during what is termed a "fit" of this kind of spasm.

We have before had occasion to remark, that the excito-motory functions may be in full activity, when those of voluntary motion are suspended, or destroyed by disease; and more than this, we often find the former increasing in activity in proportion as the latter become impaired: of this we have an instance in the case recorded by Dr. Watson, of a gentleman who, at the commencement of an attack of paraplegia, found that when he attempted to scrape his foot on the scraper at the house-door, his leg and thigh were forcibly and involuntarily flexed, and drawn upwards. And we may observe that, independently of disease, the energy of these two functions seems to vary in an inverse proportion. Thus in infancy, when the voluntary power is as yet undeveloped, the excito-motory is in the fullest activity; and, although we may not observe any inconvenient defect of excito-motory power, where the voluntary is in perfection, yet we do not commonly find in the robust, vigorous man, that liability to sudden movements of the voluntary muscles, independently of their natural stimulus, volition, which is so frequent in the delicate female; he is not so "nervous" in fact. When, then, the voluntary power of the brain is least energetic, the muscles of voluntary motion, which in perfect health in the adult subject are mainly under its influence and but little subject to the true spinal system, become almost entirely under the control of the latter; and consequently, strong, muscular contortions are excited upon the application of the slightest stimuli, and which are quite beyond the control of the will. Dr. Todd has not inaptly applied the term polarity to this power of the spinal cord of generating power within itself, to be communicated to the voluntary muscles; and if, as we not unreasonably might, we apply the same term to the power of the brain of originating voluntary motor power, under the influence of volition, we might lay it down as an aphorism, the result of observation, that the polarity of the spinal cord varies in an inverse proportion to that of the brain.

It is not by this meant, that the excito-motory functions can never become unduly susceptible, unless there be antecedent diminution of the voluntary; nor that this excessive excitability may not exist as a primary affection, independently of disease elsewhere, but merely that it is most commonly observed in those states of the system in which the voluntary power is the least; and further, that when the controlling influence of the latter is withdrawn, the former will be liable to be thrown into excessive action by ordinary causes of irritation; and that when any such cause, of a more than ordinary character, comes into operation, we shall have violent spasm. Neither must we lose sight of the fact, that the nervous centres, the one as well as the other, have the power of originating muscular contraction, and are liable to irritation from within, as well as from without, and consequently, that excessive contraction, or spasm of the voluntary muscles, may be excited by irritation, or hyperæmia of those centres, or the parts proceeding *from* them, as well as irritation along the course of those proceeding *to* them, and hence inflammatory disease of the brain, or of the spinal cord, may be simulated, as regards the "*læsa partis functio*," by irritation from without; that is to say, by peripheral and centripetal irritation, acting upon nervous matter, either in itself morbidly susceptible, or, as in the case of the spinal cord, uncontrolled by a power which is in a great measure antagonistic to it: and thus similar symptoms may arise from opposite causes, and require opposite modes of treatment. If these principles are kept in view, they will guide us to the explanation of much that otherwise appears anomalous in the diagnosis and treatment of spasmodic diseases.

In speaking of these affections, we shall proceed in the reverse order to that pursued by most authors, and commence with those which are most obviously the result of peripheral irritation.

The most familiar instances occur in the convulsions arising from gastric irritation and teething in children.

Now, as regards both of these, we have all the conditions which we have just pointed out as favouring abnormal excitement of the excito-motory system. We have the period of infancy, in which that system of nerves has the predominance over the voluntary, and we have an irritating cause at the extremities of one or other set of spinal nerves; but most children "cut" their teeth without convulsions; and all do not go into fits every time that the milk "disagrees," or that they overload their stomachs; accordingly we ordinarily meet with these convulsions in children in whom, besides constitutional debility, generally of a strumous character, there is, in addition to a liability to gastric derangements from mesenteric disease, a great susceptibility of the excito-motory system. If, from other causes, gastric irritation be set up, and there be more than ordinary inflammation of the gums in dentition, such children will be apt to be convulsed, and the greater the "nervous irritability," the greater the liability to be affected, even by the slightest irritating cause. In the diagnosis of these affections, we must carefully remember the distinction which we have just pointed out between the opposite conditions which may produce the same results, namely, convulsions—and by close examination of the general state of the system, and inquiry into the previous history, satisfy ourselves that those symptoms which indicate inflammatory disease are absent; and, in the case of children in whom dentition is going on, we may pretty safely infer, that the irritation proceeding from that process is the cause of the convulsions. In the case of gastric irritation, the irritable state of bowels, the generally abundant, or, at all events, not scanty urine, the full pupil, and reddish tongue, the tumid abdomen, the constantly quick pulse, and the absence of all the symptoms of inflammatory affections of the brain will point to the true nature of the case.

The causes of these forms of infantile convulsion will best suggest the indications for their treatment. When the source of irritation is dentition, the gums should be freely lanced, and this having been done, we must proceed to allay the irritation elsewhere. When the heat of the skin is but moderate, and the other signs of general fever are wanting, we may put the child into a warm bath, of the temperature of 100°; but if there be apprehensions of febrile excitement, the bath should not be used, except by immersing only the legs and thighs; the bowels must be carefully attended to, and if there have been merely frequent tenesmus, and expulsion of mucus, with but little fæcal matter, a drachm of castor-oil may be given, and subsequently the combination of two or three grains of bicarbonate of soda, with two or three minims of tincture of hyoscyamus, will be found a most efficient sedative to the nervous system. When the convulsions continue to recur, we may have recourse to an injection of assafœtida; we must, however, carefully watch for any signs of cerebral excitement, as the irritation at the extremities of the nerves may, in children so predisposed, set up inflammatory action in the encephalon. When this occurs, it must at its first appearance be properly met by the measures already suggested.

The same principles apply to convulsion arising from gastric irritation: the first object must be to remove all offending matters from the alimentary canal; for this purpose, from one to two grains of hydr. cum cret., according to the age of the child, may be given, and afterwards a teaspoonful of castor-oil; if, however, the bowels should have been extremely irritable, and the motions loose and abundant, it will be better to combine the hydr. cum cret. with three or four grains of compound chalk powder, and, if there be much diarrhœa, from one to two grains of compound ipecacuanha powder may be added, and the castor-oil may be given guarded with a minim, or even two, of laudanum. The warm bath up to the hips may also be here used with advantage; and, if the convulsions recur, an enema of four or five ounces of solution of assafœtida may be administered, which often affords great relief. Cases are not very rarely met with, in which the laxative remedies above recommended have brought away a considerable quantity of scybalæ resembling sheep's dung, to the great benefit of the patient. The soda and hyoscyamus, or similar soothing measures, may also be subsequently used with advantage, and followed by the course of treatment before recommended for children prone to mesenteric, and other strumous diseases in the abdomen.

Chorea.—Chorea Sancti Viti, or, as it is popularly termed, St. Vitus's dance, is another spasmodic affection; the spasm being of a clonic character. It derives its name from the movements, sometimes simulating those of the dancer at festivals or solemn games, and the name of St. Vitus has been added, because to the relic of that saint was ascribed the power of curing this affection. The appearance of a person suffering from this disagreeable affection is too well known to require minute description. The disease is most common in young persons of either sex, though perhaps young girls are more frequently affected than lads; it may, however, occur at almost any age. It is not very rare in children as young as six or seven; and there was once in Guy's Hospital a man of sixty, who was the subject of chorea; and the author was once consulted in a case of well-marked chorea in a man aged seventy-two.

The disease generally comes on gradually: the child is observed to drop things, or to be unable to hold its book or thread its needle, or is seen to be twitching one hand, for which it is often reproved as for a bad habit. The movements, however, extend generally over the side where they are first observed, and that side of the body, including often the muscles of the face, is thrown into a state of incessant motion, which movement sometimes assumes a character of regularity, or almost gracefulness, is in the salam convulsion. Generally, however, the movements are of an irregular and hurried character, most disagreeable to witness; the voluntary control over the affected limbs being, in a great measure, superseded, so that when the patient is told to grasp anything he makes several attempts with the hand, frequently missing it, and at last seizing it convulsively. The continual movements of the muscles of the face give to the countenance an expression almost idiotic, aggravated, possibly, by the diminution of voluntary energy. The speech is also imperfect; sometimes the power of articulation is entirely lost, the attempt to speak giving rise only to contortions of the mouth and tongue, attended with increased movements and an inarticulate sound.

The disease does not, however, in all cases, come on thus gradually, but it sometimes attacks a young person immediately after a sudden fright or powerful emotion. The convulsions also become sometimes so violent and uncontrollable that the patient cannot lie safely in an ordinary bed, and it becomes necessary to place him in a cot, or use some means of protection at the sides. The movements too, though almost always affecting one side, may extend to the other; and if this be not the case, the muscles of the, otherwise, unaffected side are called into continual action to counteract those of the opposite.

Chorea, as must be apparent from what we have already stated, affects exclusively the muscles of voluntary motion, and those which, though not strictly such, are under the control of the will, as is the case with the muscles of respiration, the diaphragm being often implicated; and a case occurred under the care of the author, in a girl in Guy's Hospital, in which there appeared to be chorea of the diaphragm alone. There is no proof of the purely involuntary muscles being implicated; unless the curious fact, first pointed out by Dr. Addison, of the frequent occurrence of a systolic "*bruit de soufflet*" under the left nipple, be received as evidence of the muscular structure of the heart being affected: the obscurity, however, of the mechanism of this so-called mitral "*bruit*," together with the frequent connection of chorea with rheumatism, go far to invalidate this testimony. It is remarkable, too, that the choreal movements are entirely suspended during sleep.

The diagnosis of chorea is sufficiently obvious.

The cause of chorea is generally some strong emotion, or other impression upon the nervous system; in most cases fright is the active cause, in some a cut or blow, now and then depressing emotion. In a case which occurred lately, a boy of sixteen became the subject of chorea immediately upon hearing of the death of his father from cholera. The condition which constitutes as it were the essence of the disease, consists in an excessive susceptibility of the nerves of voluntary motion, so that the muscles are thrown into contraction without the stimulus of volition, often in direct opposition to it, sometimes through stimuli conveyed from an extremity of an incident nerve; it may be, too, that the state of the nervous centre is such that muscular contractions are excited independently of any impression conveyed to it by the incident nerves. This state of the nervous system is in by far the greater number unconnected with any change in its substance appreciable by our senses, though it may be associated with structural change in the brain or spinal cord. We do, in fact, occasionally meet with cases of chorea in which there have been chronic effusions into the ventricles or on the surface of the brain, often the result of strumous disease, or in which strumous deposits upon the pia mater have pressed upon the substance of the brain. In some, the choreal have been the first active symptoms of cerebral disease, and it is not improbable that the presence of such disease may have been the means of impairing the functions of the nervous substance. These cases, however, are so rare as to prove that the cause must be sought for elsewhere; and although we can adduce no appreciable lesion in any part of the system, we have that condition which is commonly described as a want of tone: the muscles are lax, the blood is often in an anæmic condition; and undoubtedly, strumous boys and girls, and those living in large towns, are those who are commonly the subjects of chorea.

Chorea may possibly be excited by rheumatic inflammation of the theca of the spine, and one case in which there was severe chorea in a child who had been the subject of acute rheumatism was successfully treated with full doses of colchicum by Dr. Addison.

The prognosis of this disease is generally favourable, though in those cases in which there are signs of sub-acute encephalitis, strumous meningitis, or of other diseases within the cranium, it must be in accordance with such symptoms.

The treatment of chorea is in general simple and successful. The objects to be followed are—to obviate all causes of irritation or excitement,—to improve the general tone, and particularly that of the nervous system.

When, therefore, the child or young person has been exposed to fright, or subject to irritation of any kind, all disturbing causes should be carefully guarded against, particularly the annoyance arising from evident imitation by other children. The bowels should be effectively cleared out, though irritation from purgatives should be avoided. With this view, the combination of calomel with scammony or jalap should be used every third or fourth night, and its action assisted, if necessary, with tartrate of potass and senna, or in delicate children the mixture alone may be employed.

As regards tonics, we must be guided in our selection by the condition of the patient. Those which are in general most efficient are—the preparations of zinc and iron, arsenic, the combination of port wine with rhubarb, and the shower bath.

In ordinary cases the exhibition of purgatives to keep the bowels freely open, and the sulphate of zinc in doses gradually increased from a grain to twelve, fifteen, or twenty grains, or even more, will effect a cure. When, however, the sulphate has been used in these large doses, its sudden discontinuance seems to be felt by the system, and a return of the symptoms ensues: the best rule, therefore, for its exhibition is as follows: —the bowels being kept open, the sulphate of zinc should be given in doses commencing with a grain three times a day, and in the case of a child of about twelve years old the quantity should be increased by the addition of a grain daily, until the medicine causes sickness or there is an obvious diminution of the choreal movements. In the former case the dose should be diminished by at least one-half, and so continued for several days, with a view to establishing a tolerance; but if, on the other hand, there be a marked improvement, it should be no further increased, but continued without alteration until either the improvement ceases—in which case, it should be again gradually increased—or the disease has altogether subsided. Whenever the latter is the case, we ought to diminish the dose day by day, rather than discontinue it suddenly, as by following the latter course we have less reason to dread a relapse. In some cases, however, especially those in which there is considerable anæmia, the iron seems to have more control over the disease than has the zinc, though these cases are rather exceptional ones. When such present themselves, and are apparent either from the anæmic condition above alluded to or from the failure of the zinc, we may administer either the ammonio-tartrate or the ammonio-citrate of iron in the usual doses, or the mixture ferri comp. combined, when there is torpidity of the bowels, with the decoct. aloes co. (F. 92).* This form is particularly eligible for chorea occurring in connection with amenorrhœa.

Epilepsy, or falling sickness—the morbus comitialis of the Latin authors—differs from chorea in that the spasm, though, like it, clonic, recurs only at intervals, that is to say, in fits or paroxysms, and in the important fact that the proper functions of the brain are suspended, there being loss of consciousness. An attack of epilepsy is generally sudden in its invasion; the patient may have been but the instant before to all appearance in perfect health, when he suddenly utters a most terrific cry, and falls senseless and convulsed; he then, in the words of Dr. Watson, "strains and struggles violently—his breathing is embarrassed or suspended—his face turgid and livid—he foams at the mouth—a choking sound is heard in the windpipe—he appears to be at the point of death by apnœa. But presently and by degrees these alarming phenomena diminish, and at length cease; the patient is left exhausted and comatose, but his life is no longer threatened, and in a short time he is to all appearance perfectly well. The same train of morbid phenomena recur, however, again and again at different and mostly at irregular intervals." The epileptic attack or fit in many cases comes on suddenly, as we have just observed, and without the slightest warning. But it is not very uncommon, on the other hand, for patients to have some premonitory symptom, with which they often become familiar, so as to be aware of the approach of the fit. In some instances there is vertigo, or confusion of intellect; sometimes there is unusual irritability of temper, which may exist for several days previous to the fit; and at others there is an inordinate appetite for food—that not uncommon symptom of cerebral disturbance. Sometimes, again, there are symptoms recognizable by the attendants or friends of the patient, as imperfect articulation, slight distortion of the face, or squinting. But the most remarkable of the premonitory signs is the well-known "*aura* epileptica," which consists of a feeling as of the passage of a current of air from some part of the body, generally one of the extremities, to the head, or sometimes to the pit of the stomach, and which is immediately followed by an epileptic fit.

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* (92) ℞ Mist. Ferri co. ʒ v.
Decoct. Aloes co. ʒ iij. Misce.
Ft. Haust. ter die sumend.

The true pathology of epilepsy is very obscure. If we look to the symptoms, we find them to consist principally of a suspension of the proper functions of the brain—sensation, volition, consciousness—with violent clonic spasm; the muscles of respiration being always implicated, and the sphincters paralyzed; the urine being generally voided during the fit, and the lower bowels being commonly emptied. It is not, however, so obvious whether these spasms arise from derangement in the brain itself, or in the true spinal or excito-motory system, the centre of which is in the medulla oblongata; the fact of the natural functions of the brain being suspended does not preclude the possibility of the motor fibres exciting abnormal or violent muscular action, the more so since we know that disease or injury of the brain will sometimes produce convulsion at the same time that it takes away the consciousness.

Morbid anatomy, again, does not throw any certain light upon either the nature or the seat of the lesion, upon which epilepsy depends: it is true that in the bodies of those who have died in epileptic fits, and in whom there had been no other symptoms referable to the brain, congestion of the vessels in the substance and on the surface of the brain is generally found; but this congestion is in all probability the result of the mode of death, namely, apnœa. Others, again, have had repeated attacks of epilepsy, and who, as commonly happens, have evinced some signs of diminution of the functions of the brain—as impaired intellect, or paralysis, or diminished muscular power, and have been inspected after death, which has occurred independently of an epileptic fit; and in some of them there have been found induration and dilatation of the blood-vessels, in others softening with a similar dilatation; these changes affecting the white matter; whilst the grey matter is sometimes altered in consistence, easily removed from the white matter, and adherent to the membranes; but these are precisely the changes observed in those who have had similar affections independently of epilepsy; and where the other symptoms of cerebral disease have supervened, as they often do, upon repeated attacks of epilepsy, it is more reasonable to attribute the changes in the brain to the excitement and disturbed circulation attending the fits, than to suppose that the fits have been produced by what appears from the symptoms to have been a subsequent lesion.

On the other hand, we sometimes find evidence of sources of irritation which must have been permanent, and in some instances congenital, as thickening of the membrane, tubercles on the surface, spiculæ of bone, or other alteration of the bones of the cranium. These no doubt may be what are termed "predisposing causes," or rather conditions increasing the liability to epilepsy.

The conditions which predispose to epilepsy are, a peculiar conformation of the head; conical, sometimes flattened, more commonly unsymmetrical as regards the two sides, or affected with chronic hydrocephalus. Scrofula also produces great liability to this disease, and it is no uncommon thing to meet with epilepsy in persons who have plain marks of scrofula upon them, or in a member of a family of which others are obviously scrofulous. Like scrofula, too, epilepsy is often hereditary. Intemperance and excesses of all kinds also favour, if they do not absolutely induce a liability to epilepsy, and of this class of causes of debility there is none more frequent or more effectual than the wretched habit of self-abuse.

The essential causes of epilepsy are, we have said, involved in obscurity, but some occurrences certainly appear, in those who are susceptible, to act as causes. Amongst these we may enumerate strong mental emotion, particularly fright, repressed eruptions, particularly about the head; and so will suppressed discharges, and, what may at first sight appear extraordinary, hæmorrhage will also produce the same result. The sight of another person in an epileptic fit has been known to produce the disease in a person witnessing it, and a patient who has had previous fits is very likely to be thrown into one by witnessing such a spectacle; and so likely is it to be induced by imitation that those who have feigned to be epileptic have been known eventually to become really so.

The researches of Shroeder Van der Kolk, which are in the main in accordance with those of Dr. Brown Sequard, tend to show that the essential nature of epilepsy consists in an exalted sensibility of the medulla oblongata, whereby it is rendered liable to discharge itself through the operation of any irritant, whether cerebral—as inflammation or tubercle, or the irritation of diseased cerebral arteries, mental or emotional excitement; or centripetal and reflex, as irritation in the intestines, the generative organs, and, we might add, any part of the system: irritation of any part being more likely to produce an epileptic paroxysm in proportion as it is more freely supplied by sensorial nerves. It is from this circumstance, no doubt, that there have been described almost as many kinds of epilepsy as there are organs in the body. These sources of irritation are however, as we have just observed, not sufficient of themselves to induce epilepsy, though they may do so where there is this susceptibility of the medulla oblongata.

The diagnosis of epilepsy is, in the majority of cases, not difficult; but there are three conditions from which it is important to distinguish it—from apoplexy, from hysteria, and from no disease at all, that is to say, from malingering or feigning.

In a case where the previous history is known, or where we have been made acquainted with the circumstances of the attack, there is no great difficulty in distinguishing epilepsy from apoplexy; but if we are called to a person who has been found in a fit some caution is required in this respect. In the first place, it must be borne in mind that epilepsy may be apoplectic; that is to say, that the injury to the brain which produced apoplexy may, at the same time, produce epilepsy; in this case, there will be the signs of apoplexy superadded to those of epilepsy. The pulse will be either full and labouring, or quick and feeble; the breathing will be slow and stertorous, not hurried and gasping and whistling, as in ordinary epilepsy; and in such cases it will generally happen that the convulsion is hemiplegic; that is to say, affecting one side almost entirely.

It must be remembered, too, that epilepsy is far more frequent in early life than is apoplexy.

Hysteria may still more closely simulate epilepsy, and in some instances, perhaps, hysteria does give rise to true epilepsy; that is to say, the seat of irritation may be in the uterus or its appendages. In most cases, however, of hysteria, which simulate epilepsy, we may observe that the patient has sufficient consciousness not to injure herself in her convulsions; she does not bite her tongue or bruise herself, and there is frequent screaming, whereas although epilepsy begins with a cry, the cry is not repeated.

The greatest difficulty, however, is with malingerers, if they are skilful ones. Here we have some of the differences pointed out in the last case. Pretenders rarely hurt themselves by their falls, though they may have resolution to bite the tongue. They generally, too, choose public situations or places, which will serve to attract the attention of those whom they wish to deceive, for their performances, but will rarely exhibit before a medical man. Their contortions are often more violent than those of real epileptics, and the more so the more they are watched; but though more violent the convulsions are not so forcible; the true epileptic exhibits a power during the fit far beyond what is natural. Epileptics during the fit are insensible to external impressions, and the pupils are not obedient to the stimulus of light, circumstances, the latter especially, which it is impossible to simulate. In epilepsy, again, the eyelids are partially open, and the eyeballs prominent and distorted, whereas the malingerer generally closes his eyes altogether. Various contrivances have been suggested for detecting impostors of this kind.

The prognosis of epilepsy is in the general way unfavourable; it is less so before puberty than after, in females than in males. The changes which take place in the nervous and circulatory systems about the time of puberty may be hoped to be beneficial in those who have been thus afflicted, and particularly so in females; and even after puberty has been established, uterine derangements are so frequently a source of fits, which, though they might perhaps be called hysterical, are so perfectly epileptic in their character, that we cannot regard them as anything else, unless we are guided solely by a suspicion as to their origin; and as this must always be obscure, we may reasonably hope that in such subjects the disease is dependent upon a cause which is not necessarily permanent.

As regards the form of disease itself, the centric is necessarily more incurable than the excentric, and the excentric is more hopeful in the inverse proportion of the time during which it has lasted.

The treatment of epilepsy during the fit must be directed to preventing the patient injuring himself, and obviating any immediate danger from the violence of the convulsion, the impediment to the respiration, and the disturbance of the circulation. For the former purpose it is necessary to place the patient in such a position as that he shall be least liable to strike himself against anything that will hurt him during the paroxysm ; and if possible to thrust a piece of cork, or part of a silk handkerchief between the teeth. Great watchfulness should also be exercised over those who are liable to epilepsy, to prevent their placing themselves in a position in which a loss of power of supporting themselves would be peculiarly dangerous: as before a fire, by the water-side, or unattended in a great thoroughfare.

The next object is to guard against any internal injury. Now it may be apprehended that epilepsy, from the obvious engorgement of the vessels of the head, may give rise to apoplexy, and that to prevent such a catastrophe, it would be well to bleed the patient from the arm ; but experience has shown that this measure is a dangerous one : whether it be that you cannot greatly relieve the internal pressure in this way, whilst there is so much obstruction to the circulation owing to the suspended respiration, or whether it be that the effect of the abstraction of blood is to prolong the fit, and aggravate its violence, the result of bleeding during an epileptic fit, when it has been really such, and not apoplectic, is that several persons so treated have died ; whereas death from an epileptic fit is a comparatively rare occurrence ; and further than this the tendency to a recurrence of the fits is much increased by depressing effects of bloodletting upon the system at large. But though this may not be done, we may apply cold to the head, and when the fit is long continued, and particularly if there be reason to believe that the bowels have not been freely relieved during the preceding twenty-four hours, a stimulating clyster may be administered. The treatment between the fits is the most important, and must be directed towards removing the tendency to them, and protecting the patient from their more obvious causes.

In the first place, all those circumstances which tend to increase the liability should, if possible, be removed. We cannot indeed relieve the patient of his inherited tendency to this dreadful malady, neither can we cure him of those habits, generally evil in themselves, which aggravate, and in some cases even originate the liability ; but we can warn him of their consequences, and point out the certain ruin to which he is hurrying himself. It is true, indeed, that our warnings will but too often be, like those of the teachers of morality and religion, listened to with attention, and their reasonableness acquiesced in, yet disregarded or forgotten upon the first temptation; but whilst we find some who are increasing their susceptibility to epilepsy, by vicious courses, we meet with others who are bringing about the same result by pursuits harmless, or even praiseworthy in themselves; and they also must be warned that what others may do with impunity they must not attempt, except at the peril of increased frequency or severity in the attacks. To use the graceful language of Dr. Watson, "The patient who is subject to epilepsy should live by rule, and be temperate in all things. His diet should be simple, nutritious, but not stimulating. He should renounce all strong liquor, and become, in the new-fangled and vulgar phrase, a teetotaller. He should rise early, and take regular exercise in the open air; keeping his head cool, and his extremities warm. He should avoid all mental excitement, and the fatiguing pursuit of what is called pleasure; all probable sources of sudden anger, surprise, alarm, or deep emotion of any kind; all striving and contention of the intellect. The student of whatever age and sort in whom epilepsy has declared itself, should shut his books; the man of business abandon or abridge his professional toil; at least they must be instructed to abstain habitually, in their respective callings, from such application as would task and strain their powers, whether mental or bodily; and endeavours should be made to engage their thoughts, and interest their minds in less engrossing objects of attention."

The treatment of epilepsy with a view to the prevention of the fits has been empirical beyond that of perhaps all other diseases. Its *cure*, however, when it can be effected, must consist in the removal of that condition of the medulla upon which the susceptibility to excessive excitement depends. This susceptibility, be it remembered, is a very different thing from sensation, and therefore is not to be overcome by those means which diminish sensation. Thus, as Van der Kolk observes, chloroform, which destroys sensation, increases this susceptibility for reflex action. The same remark applies to the true narcotics, such as opium, and the salts of its alkaloids, and also to conia. Of all the so-called narcotics, belladonna, which is perhaps purely sedative, is the most worthy of a trial, and may be employed in doses of from half a grain to a grain three or four times a day. Digitalis has also considerable influence in checking the development of the epileptic paroxysm, probably by reducing the injecting force of the heart, and counteracting the tendency to congestion of the medulla oblongata. The infusion is the form recommended by Van der Kolk, who mentions a case in which the fits were suspended for six months by the use of this preparation, though the powder had produced no effect: at the end of that time they recurred in consequence of onanism, to which the patient had about this time addicted himself.

As regards more active measures, it is most important to keep up all the evacuations in their natural activity, or rather beyond it; and sometimes it may be well to set up some artificial discharge, especially if the disease have supervened upon the suppression of any, whether natural, morbid, or artificial; but in doing this the general health must be maintained at its full standard, and the tone of the system improved as far as can be without inducing plethora, or excitement. It is therefore necessary to have recourse to occasional purgatives to insure a free action of the bowels; and where there has been suppuration or diminution of any previous discharge, as from hæmorrhoids, or former ulcers, a blister should be applied, from time to time, at the nape of the neck; and when the former discharge has been of long continuance a seton should be used. In females in whom there has been a cessation or diminution of the catamenia, aloetic purgatives should be employed, and where there is any appearance of anæmia they may be combined with iron. The mist. ferri co. with decoct. aloes co. answers this purpose admirably.

When there is decided evidence of a plethoric condition, and the pulse is strong and hard, and previous attacks have been preceded by headache, with throbbing of the carotid and temporal arteries and evident congestion of the superficial veins, blood may be abstracted with benefit; but even this will, in the majority of cases, be best done by cupping from the nape of the neck. The cupping is probably of additional service from the derivative effect of the glasses. Van der Kolk relies mainly on derivatives, which he recommends in the form of issues or setons placed as high as possible. In very sensitive patients the tartar emetic ointment may be employed. When these symptoms are wanting we should best obviate the tendency to local hyperæmia by the use of tonics. Amongst these we must not omit those most important ones, air and water. Moderate exercise in the open country, where it can be effected, should always be employed; and the cold shower-bath used, which may always be safely done if it be followed by a gentle glow upon the surface. Of tonics the mineral ones seem to have the greatest control over the fits. Iron is not admissible when there is much headache, or when that symptom follows its use: copper is next to iron as a general tonic, and has perhaps more influence upon the nervous system: it may be given in the form of sulphate, in doses beginning at a fourth of a grain, and gradually increased to three or four grains, provided it produce no irritation in the stomach or bowels; it has in several cases greatly prolonged the intervals between the fits, though in two instances in which it was employed, the fits when they recurred did so with greater, and in one instance fatal violence. Silver, in the form of nitrate or oxide, has been much praised as a remedy for epilepsy, and in the cases requiring tonics it is one of the best: it has, however, the disadvantage of sometimes rendering the skin black, or rather bluish, by the deposition, as it is supposed, of the oxide of the metal upon the rete-mucosum; certain, however, it is, that such an event has sometimes followed its use. Zinc is not liable to the same objection, and from its superior efficacy as a nervine tonic, and its being less apt to cause determination to the head than any other of the mineral tonics, is upon the whole the most eligible. It may be given, as in chorea, in doses gradually increased from one grain to twenty or more, as far as the stomach will bear it; and when it has produced a decided benefit, the dose should be reduced upon the descending scale. Arsenic is another very valuable mineral tonic, acting through the blood upon the nervous matter; it must, like the zinc, be given persistently in order to obtain any effect upon the disease, and its action upon the conjunctivæ and tongue must be maintained for some weeks.

TETANUS.

This formidable malady, though one over which unfortunately art has little or no power, is, nevertheless, one with the symptoms of which, as well as the circumstances which may induce it, every medical practitioner, whatever be his department, should be well acquainted. It consists essentially in tonic spasm, or, in plainer language, of a long-continued and violent cramp, affecting the muscles of voluntary motion, first those of a particular part, as the muscles of the lower jaw, and finally implicating those of the whole body.

The disease generally commences in the muscles of the jaws and throat; those of the neck are also soon involved. The patient finds that he has a difficulty in opening his mouth, and after a time the jaws close entirely and with great firmness. The affection of the face and jaws is known by the name of *trismus*, and is characterized by a remarkable contraction of the features. In the case of a little girl brought to Guy's Hospital, under the care of the author, the mother of the patient said she could hardly recognize her as her child. The muscles of deglutition next become affected, so that there is an almost inability to swallow; then there is intense pain in the ensiform cartilage of the sternum, shooting through to the back, arising probably from spasm of the diaphragm. The disease next attacks the trunk and extremities, affecting more particularly, in the case of the latter, the motors of the large joints. When it affects the muscles of the back, it is termed opistotonos, and in this form of the disease the throat, shoulders, and lower extremities are sometimes so forcibly drawn backwards that the patient appears to rest solely upon the occiput and the heels. When the muscles of the anterior of the trunk are chiefly affected, the disease is said to assume the form of emprosthotonos, or when either side, of pleurosthotonos.

From the first commencement of the disease till its termination, the contraction of the muscles never entirely subsides, unless it be in some instances when sleep has been procured. The spasms, however, do undergo slight mitigations, for they can hardly be called remissions, or perhaps they might with more propriety be said to have exacerbations in their severity. There are few diseases more painful to witness than is tetanus, especially during the exacerbations of the spasm, when the eyeballs are fixed and prominent, the nostrils dilated, the angles of the mouth drawn up, the features contracted, the brow corrugated. To the horrors of this spectacle must be added that of knowing that these contractions are attended with intense pain. The intellects are throughout unaffected.

The mode of death is of a mixed character, that is to say, by asthenia and apnœa combined. There is no spasm of the heart.

The most frequent cause of tetanus, in this country at least, is bodily injury, generally in the form of a lacerated wound. It would seem, too, that injuries about the mouth and face are peculiarly apt to excite it. A little girl, aged about nine years, who died of this disease in Guy's Hospital, under the care of the author (and the disease is most uncommon in such a subject), became affected by it consequently upon laceration of the lips from a fall. It does, however, arise from exposure to cold, particularly when the body is much heated. This is probably the reason why this form, or idiopathic tetanus, as it is sometimes termed, is of much more frequent occurrence in tropical climates. In a case of idiopathic tetanus which occurred in Guy's Hospital, under the care of Dr. Bright, in the summer of 1835 —a remarkably hot season—the patient attributed the disease to exposure to cold when much heated.

As regards the treatment of tetanus, we know of no remedy upon which any reliance can be placed, though a very long list might be given of those which have at different times been confidently recommended. This is more especially the case with the traumatic form of the disease. Recoveries, however, though we can hardly call them *cures*, do take place when the disease assumes a mere chronic form, and the same may be said of idiopathic tetanus.

It is, however, incumbent upon us to obviate every circumstance which may aggravate the disease or increase the sufferings of the patient; the wanton trial of drugs or other appliances is therefore to be reprehended. The strictest quiet should be enforced; light and noise, and the disturbance even of the air in the apartment, should be guarded against. When the bowels have been well cleared out, the patient should not be disturbed by aperients.

In the idiopathic form of tetanus treatment is not so hopeless. The patient already alluded to as treated by Dr. Bright, recovered under the use of cupping at the nape of the neck at the commencement, and the persistent administration of calomel, opium, and antimony: quina in decoction of bark and wine. The cold shower bath was twice used, but as its second application appeared to aggravate the symptoms, it was discontinued. The cannabis Indica has also been recommended in this form of tetanus, as observed in hot climates. In a chronic case of traumatic tetanus, which recovered under the care of Mr. Aston Key, the last remedy employed was calomel. This was first administered on the sixteenth day, a grain being given every hour for eight doses on that day, seven on the day following, and six on the next.

HYDROPHOBIA.

A still more terrible malady is hydrophobia. It consists essentially in excessive nervous irritability, attended with extreme horror of the causes which excite that irritability. This susceptibility of spasmodic contraction manifests itself chiefly in the muscles of deglutition, sometimes inducing an inability of swallowing, and being called into intense activity even by the sight or sound of liquid—hence the name of the disease. Its alone cause is a specific animal poison, introduced in the system by the bite of a rabid animal. For instance, a man is bitten by a dog. The wound may heal readily, though in some instances it is inflamed and irritable. After a period varying from six weeks to a year, or even a year and a half, which may be termed the period of incubation, the patient feels pain in the situation of the bite; sometimes it becomes red and swollen. The patient has a feeling of general illness; convulsive constriction of the throat, with a difficulty in swallowing liquids quickly succeeds, attended by slight acceleration of the pulse. Then follows the horror of the sight or sound of liquids, spasmodic contraction of the muscles, those particularly of the pharynx and larynx, convulsive paroxysms excited by the least noise or movement, or even by currents of air. The patient becomes delirious, and either dies in the recurrence of the paroxysm, or sinks exhausted.

Of the morbid anatomy of hydrophobia we know nothing.

In an inspection related by Dr. Wilks, the blood was dark and fluid, and there was general internal congestion. The larynx was healthy, but there was a remarkable appearance of the pharynx, which was dilated as if violent muscular contraction had occurred in it; the mucous membrane was swollen; the glands were enlarged, and covered with a thick secretion, as were also those at the back of the tongue.

Of the treatment of hydrophobia we have nothing to say, except that, as in the case of tetanus, all circumstances which may excite the spasms should be carefully excluded. Our only resource lies in prevention. The early and complete excision of the part is the measure upon which most reliance may be placed. Some have recommended cauterizing with nitrate of silver, but the knife is most to be relied upon, provided the situation of the wound is such that it can be used effectually. Where this is not the case, after all has been removed that can be, the wound should be washed thoroughly, and finally the lunar caustic in substance applied to every part of it. It is true that this severe precaution may sometimes have been applied needlessly, since all who are bitten by rabid animals do not become affected; but it would be better that ten persons should be so treated, or even, if necessary, undergo amputation, than that one should die so horrible a death.

XXX.

INTERMITTENT AND CONTINUED FEVERS.

When a person has been attacked with chilliness, or shivering, or lassitude, and this has been followed by increased heat of skin, accelerated pulse, pains in the limbs, coated tongue, loss of appetite, thirst, and general derangement of the functions of the system, he is said to be the subject of fever.

This state, as we have pointed out, may be excited by inflammation existing in any part of the system, and is then termed inflammatory fever; but, on the other hand, it may arise as a primary disease, independently of any local affection, and is on that account called *idiopathic* fever. We have already seen, in treating of inflammation, that the character of the fever admits of considerable variations, sometimes marked by continued force and frequency of the pulse, evincing the truly inflammatory fever, and at others characterized by softer pulse, greater tendency to prostration, and failure of the moving powers of the circulation, constituting what has been termed *typhus* fever; and it will generally be found that these idiopathic fevers are more or less of the latter character.

It is not altogether to be overlooked that many distinguished physicians, more especially on the continent, have maintained that all fevers have their origin in some local inflammation; and in proof of this, there has been adduced the almost constant occurrence of some change which might be ascribed to inflammation in the bodies of those who have died from them. If, however, this evidence be carefully analyzed, it will become apparent that there is no anatomical change, essentially characteristic of fever, which may not be explained by the congestion, arising from the impeded circulation in the extreme vessels dependent, probably, upon an altered condition of the blood, or, which may not be shown to be the result of an inflammation arising in the progress of the fever; and consequently, if at all connected with the fever, in the way of causation, so connected as effect rather than as cause.

Setting aside, then, the theory that ascribes all fevers to the effect of a local inflammation—both for the above reasons, and also upon the ground that nearly all physicians have found the practical necessity of recognizing the existence of a state of pyrexia, that may be distinguished by its history and symptoms, from fever arising from a local inflammation we proceed to state briefly the signs by which idiopathic fever in general may be distinguished.

First of all we have the negative sign, that of the absence of all symptoms which indicate the existence of inflammation in any part; and to this may be added the character of the fever, that it is always prone to the typhous or sinking form; thus the pulse is more readily compressed than in the inflammatory fever: the secretions generally are more vitiated, especially those about the mouth, which speedily become viscid and dark. The nervous system is generally more oppressed, there being early stupor or confusion, great weakness, with giddiness or vertigo, and a tendency to syncope on the slightest attempt at exertion. There are derangement of the external senses,—generally in the way of diminution,—as shown by the frequent tendency to deafness; a failure rather than perversion of the intellectual faculties, as shown by the character of the delirium, unattended with violence, generally approaching to stupor, and commonly described as low and muttering. There is an altered condition of the blood, which shows impaired vitality, sometimes losing entirely its power of coagulation, and at others showing signs of putrescency, giving rise to gangrene from slight irritation,—the red corpuscles, too, often breaking down and allowing the effusion of the colouring matter through the serum or into the tissues, whence arise petechiæ, vibices, and passive hæmorrhages.

Over and above these symptoms of depression of the nervous power, and so-called putrescence of the blood and tissues, there is often a disposition to a defined inflammation of the skin, in many instances of a specific character, and appearing a certain time after the first invasion of the fever: this belongs essentially to what are termed the exanthems or eruptive fevers, but is seldom altogether wanting in the ordinary continued fever.

Another remarkable peculiarity by which idiopathic fever is distinguished from that which attends local inflammation, is its tendency to spontaneous favourable termination. This tendency, which shows itself in a variety of ways, forms, in fact, the basis of the division of fevers into three pretty generally recognized classes.

In the first or *intermitting form* we have a perfect subsidence of the febrile symptoms after a cold and hot stage; this subsidence being attended by a copious spontaneous sweating, the fever returning after an interval of 24, 48, or 72 hours, and again subsiding after running through the same course.

In the second or *remitting form* of fever there are distinct remissions of the symptoms occurring generally once in twenty-four hours, but not perfect subsidence of them.

The *continued fever*, in which there is little or no abatement of the symptoms till after the lapse of several days, when sometimes as early as the 7th and at others as late as the 30th, or even 40th, but most commonly about the 20th day, or earlier, a spontaneous subsidence of the symptoms takes place, sometimes very gradually, and at others almost suddenly, and attended by copious evacuations from the skin or kidneys.

Another remarkable circumstance, and one peculiar to idiopathic fever, as opposed to that arising from local inflammation is, its tendency to become epidemic in districts or communities; thus showing that it arises not from general causes, like those which excite common inflammation, but is the effect of some agencies which have a local or temporary operation. Of the local and temporary, we have good evidence of the existence of two, one or the other of which, or both conjoined, are the immediate causes of all idiopathic fevers; namely, malaria or contagion.

Of the existence of one form of malaria; namely, that proceeding from the decomposition of vegetable matter, commonly known as the marsh miasm, there is little or no doubt, either in the minds of medical men or of the public generally; and this miasm is also acknowledged to be the alone cause of intermittent fevers or agues. This poison may possibly be generated accidentally, so as to affect only a particular individual or family: or from causes to be presently noticed, its effects may not manifest themselves in an individual till after he has been for some time removed from the sphere of its influence; but they are so commonly observed to prevail in marshy countries, that there is no doubt entertained of these effects being produced by a local cause, and the disease is said to be *endemic*. Now these endemic intermittent fevers are never communicated by personal intercourse to persons living beyond the district in which they prevail, and are also observed so constantly in marshy localities that there has been no controversy as to the origin of the morbific agency.

Other forms of fever, again, are observed to prevail for a time in a community, attacking large numbers in quick succession, and then subsiding, often reappearing in some neighbouring population, and in this manner sometimes traversing whole continents; these are said to be epidemic. Concerning the origin of such diseases, there is much more doubt than in the case of the endemic. Some of them, of which the best instances are amongst the eruptive fevers, are so undoubtedly propagated by intercourse with subjects of the disease, that no doubt has ever been entertained by the experienced of the agency of contagion; but even with these there are obviously other conditions which regulate their extension through a population; so that although contagion as an immediate cause cannot be called in question, the necessity of some other influence, in order that that cause may take its full effect, is hardly to be disproved. Other epidemics, again, attack a population so suddenly as scarcely to admit the supposition of their being propagated mainly by human intercourse; and thus we are constrained to recognize the possible existence of a malaria not depending upon local causes, but coming suddenly upon different districts. The question, then, of the origin of epidemic diseases becomes a much more complicated one than that of the endemic.

The stating a disease to be contagious implies also that it arises from an animal poison; since it means that a person affected with a given disease is capable of generating in his own person a poison similar to that which first excited it in himself, and which is therefore capable under favourable circumstances of exciting a similar disease in another; and herein consists the difference between such poison and poisons derived from the mineral and vegetable kingdoms.

Setting aside, then, for the present the eruptive fevers, we may lay it down that there are some arising from the marsh miasm, and which are not communicated from person to person, but are endemic in certain localities; these are of the intermittent form; that there are others which are apt to affect a population for a time, the spread of which is favoured by filth and the presence of decomposing animal matter, and which are also rapidly propagated when a number of persons affected with them are crowded together, so as to leave no doubt that the specific poison exciting the disease may be generated or multiplied within the system; and these fevers are of the continued form.

Enough has perhaps been already stated to make it apparent that the doctrine which would ascribe all fevers to the effect of a local inflammation is not founded on a comprehensive view of the facts, and the same may be said of that which would explain them solely upon the principle of a change in the blood, or disturbance of the nervous system. We shall be nearer the truth in stating—what indeed is not so much the enunciation of a theory as a summary of the facts observed in the progress of various forms of fever—that the morbific agent, after remaining for some time latent in the system, acts simultaneously upon the blood and its moving powers—upon the heart and upon the extreme circulation, *i. e.*, upon the vital interaction of the blood in the capillaries and the tissues,—upon the nervous system, and upon the functions of the secreting organs,—unless indeed these latter actions are to be included in the two former.

But the peculiar action of the morbific cause upon all these parts of the system is a depressing one, and this depression is followed by an increased activity of the moving powers of the heart, without, however, restoring the healthy capillary circulation; and this increased action is apt to be followed by a failure of the action of the heart and large vessels, threatening death from asthenia or syncope; though this mode of death may also arise from inflammations prolonging the fever, or inflicting injury upon some vital organ.

INTERMITTENT FEVER.

A paroxysm of ague or intermittent fever has generally been regarded as an epitome of a continued one, and for this reason most authors commence the subject of fevers with the consideration of intermittents.

The first invasion of a paroxysm of intermittent fever, or ague, as it is commonly called in this country, is marked by those symptoms which have been already described as belonging to the commencement of the febrile state, but with great intensity. These are lassitude, pains in the limbs, giddiness, with a sense of weight or oppression about the epigastrium. The patient then begins to feel chilly, and have a sense of coldness down the back, the extremities become cold, the fingers shrunken, and the nails blue, the skin is shrivelled, and the papillæ become prominent, constituting what is commonly termed goose-skin, or more learnedly *cutis anserina;* the countenance also is shrunken, the nose cold, the patient shivers, and his teeth chatter, and he is glad to draw close to the fire, or envelope himself in blankets. He not only *is* cold, but he *feels cold*, and he acts accordingly.

The pulse is sometimes frequent, but always feeble; there is apparently a failure of the moving powers of the blood, which seems scarce to reach the surface. The tongue is white and dry; there is but little urine secreted, and the bowels are confined: after this state of things has continued for a greater or less length of time, the heat of the surface begins to return, the patient has flushings and becomes warmer and warmer, and ultimately the whole surface is of a dry, burning heat; the shrivelled and livid extremities resume their natural colour, and even become turgid: he has at the same time intense thirst, restlessness, and severe headache; the urine is scanty, high-coloured, and turbid, the tongue furred and dry; the pulse frequent, full, and strong. After the second or hot stage has continued for some time, another change comes over the patient; a moisture gradually appears upon the face and forehead, the harsh and hot skin becomes soft, and at last a copious sweat breaks out over the whole surface, affording him great relief. There is also a copious discharge of urine, which however is still high coloured, and the several functions of the system return to the condition in which they were before the commencement of the paroxysm. After a certain period of intermission, the paroxysm recurs, the time between the commencement of one paroxysm and the commencement of the next being termed the *interval*, and it is from the length of this interval that the different forms of intermitting fevers receive their names. Thus when a paroxysm recurs daily, the ague or intermittent is said to be a quotidian; when every alternate day it is termed a tertian, the day on which the former paroxysm occurred being included and reckoned as the first. When again the paroxysm recurs after an interval of three days, or on the fourth day, including that on which the former paroxysm occurred, it is termed a quartan.

There are, indeed, other forms of intermittents in which the interval is longer, and which have been named quintans, sextans, septimans, &c.; but these are not so regular in the recurrence of the paroxysms, which are apt to return at such uncertain intervals, as to lead to the belief that they are irregular varieties of the more ordinary forms of the disease. Sometimes, again, the paroxysms will recur daily, but with those on the alternate or tertian days corresponding to each other in severity, duration, character, or time of invasion. In these cases the patient is said to be affected with a double tertian; or again, there may be a paroxysm occurring on two consecutive days, leaving only one day of intermission; but in these cases those on the quartan days correspond in character with each other, and when this happens the disease is said to be a double quartan. Another form of double or even triple quartan is when the paroxysm observes the quartan days, but there are two or three paroxysms on each of those days.

There is much variation in the duration of the paroxysm in different subjects, and even of the different paroxysms in the same case, as the time occupied by the whole paroxysm may vary from three to sixteen hours, the average being about four or five; the same also applies to the different stages of the paroxysm. The cold stage may pass off in less than an hour, or it may be prolonged for several, though about two hours may be said to be the average duration; and the same uncertainty attaches to the hot and sweating stages. It is, however, remarkable as a general rule, that the longer the cold stage the shorter the paroxysm, and the shorter the interval the longer the paroxysm. Thus the quotidian has the shortest interval and shortest cold stage, but the longest paroxysm; the tertian a longer interval and longer cold stage, with a shorter paroxysm; and the quartan with the longest cold stage has the shortest paroxysms.

Another curious rule, though one by no means without exception, is, that the shorter the interval the earlier in the day does the paroxysm take place. Thus the quotidian paroxysm generally commences in the morning, the tertian about noon, and the quartan in the evening.

The pathology of intermittent, as of all forms of fever, is necessarily obscure. We are aware from observation that during the cold stage there is great congestion or accumulation of blood in the great reservoirs, the liver, spleen, and large veins, a state of things which we know will arise when the action of the heart is very feeble; so that it is by no means certain that this internal congestion is anything beyond the immediate result of the diminished force of the moving powers of the circulation. The cold stage has by many been regarded as the cause of the hot; but that it is so, further than, that, in general, the state of any being at any time is the effect of that which preceded, cannot be received as proved; since we find that there is no certain relation whatever between the intensity and duration of the cold stages and those of the hot. The hot skin, thirst, scanty urine, headache, &c., of the hot stage are perhaps to be explained by the difficult capillary circulation with the consequent increased force of the heart's action, and arrest of secretion, arising from the loss of the affinities between the blood and the tissues, and which we believe to be essential to the febrile state. There is perhaps less difficulty in accounting for the sweating stage by the increased force and frequency of the heart's action, and gradually returning capillary circulation, though whether this perspiration is critical, and therefore by restoring the blood to its normal condition restores also the healthy relation between the blood and the tissues, or whether this previous subsidence of the febrile action is the cause of a free capillary circulation, and consequently more copious secretion, is a question which will be answered, according as the belief may happen to prevail that the miasm acts mainly upon the blood, or the nerves.

It is unprofitable to theorize where we know so little. It may, therefore, suffice to remark: that if it be assumed that the malarious poison acts purely by impression upon the nerves, without necessarily being taken into the circulation, the recurrence of the paroxysm must be accounted for solely by that hitherto unexplained tendency to periodicity, which is so remarkable in many of the animal functions; but that we shall be quite unable to explain the circumstance of the morbific agency remaining, as it often does, long dormant in the system, until called into action by some favouring state of the body; whereas, if we assume the poison to be received into the circulation, and in virtue of its presence there to produce the phenomena of the disease, we shall frame a more plausible theory of intermittent fevers, referring the cold and congestive stages to the action of the poison destroying the affinity between the blood and the tissues in the capillary circulation, and thereby causing congestion of the internal organs; the hot stage again being the effect of the reaction from this state of congestion, which induces the sweating stage, in which the poison that has been accumulating in the system since the preceding paroxysm is eliminated from it, whereby the patient is restored to health, till an accumulation again takes place sufficient to produce a paroxysm. But in order to receive this explanation, we must also admit the possibility of the poison being generated in the system, since paroxysms will often continue to recur in those who are removed from the malarious atmosphere; and although we have no difficulty in believing this of poisons which are in the first instance of animal origin, we cannot readily admit it of those which are not so.

The alone cause of intermitting fever is miasm, of which we know nothing excepting its effects. This miasm emanates from marshy lands, and is supposed to be generated by the decomposition of vegetable matter. There is, however, reason for believing that it may be produced in certain soils when saturated with moisture, but in which there can be no vegetable decomposition taking place. As regards the propagation of the disease by human intercourse, it may be confidently asserted that in this climate it never is so; though under certain circumstances in hot climates the intermittent fevers may in many of their symptoms, as well as in the tendency to putrescency of the blood, approach more nearly to the lowest and most malignant forms of continued fevers, and excite a suspicion of their also acquiring that most important property of continued fevers, namely, that of spreading by contagion.

Passing by, however, these exceptional cases, we proceed to observe that the diffusion of this miasm is regulated by certain laws, both as regards the conditions external to those who are exposed to its influence, and their state of system at the time; these latter have been miscalled predisposing causes.

As regards the laws which regulate the diffusion of the miasm: the most powerful agent is heat, the virulence of the miasm being nearly proportionate to its intensity—though occasionally epidemics of unusual virulence do occur which cannot be accounted for in this way—the poison does not readily diffuse itself through the atmosphere, nor rise to any considerable height above the surface of the ground, the inhabitants of the upper stories of houses often enjoying a greater immunity than those beneath them. The malaria is more dangerous, and therefore more active, in the night than in the day time; and from this it has been inferred that though the heat of the sun's rays favours the evolution of the miasm, it afterwards dissipates it, though it is possible that the greater activity of the poison in the night may be owing to the presence of the dew. The poison is also wafted by the winds, being more virulent to the leeward than the windward of marshes, and apparently attracted and even stayed in its progress by trees, so much so that not only is the immediate vicinity of woods dangerous, but a number of trees intervening between a marsh and a village appears to afford its inhabitants protection. It is apparently neutralized by passing over the sea, and its virulence diminished by the cultivation of waste lands. As regards those exposed to its influence, it has been ascertained that the permanent inhabitants of a malarious district are less susceptible of the effects of the poison in producing intermittent fever, though they appear to suffer from its agency in a more chronic form, being sallow, anæmic, and often affected with visceral disease.

There are, again, certain conditions in the individual which render him more susceptible of the agency of the poison, and which have been therefore called predisposing causes of intermittent fever, though they were never known of themselves to give rise to any form of that disease. Thus it acts, like all other causes either of inflammation or idiopathic fever, more powerfully upon those whose strength has been impaired by intemperance, fatigue, privation, excessive evacuations, or depressing mental emotions; whereas all agents, whether physical or mental, which permanently strengthen the system, are the most efficacious in enabling it to resist its influence. Exposure to great heat or cold, the remaining in wet clothes or with damp feet, and standing upon damp ground, exposure to watery exhalations, and especially to dew, are formidable adjuvants to the action of the malaria.

In hot climates the whites are far more susceptible of the effects of malaria than the blacks.

The poison when imbibed appears to lie latent for an indefinite time—in the agues of this country often for six or nine months; and it is remarkable that after its effects have for a time ceased to manifest themselves, or have not yet made their appearance, it will be called into action by any of those conditions of the system which constitute a susceptibility of its influence.

Besides the morbid changes in the liver and spleen, which are so frequent as to appear almost the necessary consequence of ague, if allowed to exist for any length of time, we have not unfrequently superadded some local affection, not so specific or uniform, the effect of the same cause, giving rise to what is termed complicated ague; such complications being generally seated in the head, the chest, or the abdomen.—Symptoms of congestion, irritation, or even inflammation of the brain or its membranes have not unfrequently supervened in the progress of ague, giving rise to pains in the head, stupor, coma, delirium, or convulsion.—Inflammatory affections of the chest, such as bronchitis, pleurisy, pneumonia, or even pericarditis, and presenting the ordinary signs of these affections, though in a somewhat subdued form, are liable to occur in winter and the early spring.—The abdominal complication is, however, the most common, and prevails most during the summer and autumn; it may amount to no more than congestion of the mucous membrane of the canal, associated with depraved secretion from the liver, exciting sickness and moderate purging. In other cases, however, there is more decided inflammation either of the intestinal mucous membrane, of the liver, or of the spleen.

The prognosis of ague is to be considered first in reference to the immediate safety of the patient, and next to ultimate restoration to health. As regards the first question, there is little or no immediate danger to be apprehended from agues occurring in persons whose constitutions are naturally sound, and have not been impaired by age, disease, or irregular habits; and this is still more the case if the disease be tertian or quartan, and occurring in the spring; but, on the other hand, where the constitution has been weakened by any of the above-mentioned causes, there is great danger of death from sinking under the general disturbance set up by the disease; and this is still more likely to ensue in the autumn, and if the ague be a quotidian, or attended with disturbance in the alimentary canal. Upon the whole, however, it rarely happens that a person dies in this country, either in the paroxysm or during the continuance of the intermittent. As regards the second point, however, the prognosis is not so satisfactory, since it by no means follows, that because the paroxysms have ceased to recur, therefore a perfect cure has been effected, and the patient rendered safe from the ill effects of the ague and of the miasm which excited it: for we know that during the cold stage there is great congestion of the liver and spleen, of the latter more especially; so much so as in some instances to have caused death by rupture of the organ from over-distension. The effect of this frequent congestion is an induration of one or both of these organs, of the latter so frequently that the enlarged spleen is familiarly known by the name of "ague-cake;" and we know that the immediate effect of these indurations is obstruction to the passage of blood through the veins converging to the vena portæ, and its remote consequences—diarrhœa, dysentery, and dropsy. We have reason to believe also that there is a connection between the action of the miasm and the sallow, bloodless aspect so often observed in those who have been the subject of intermittent;

whether this anæmic condition be brought about through the agency of the diseased spleen, or whether both are to be regarded as the joint effects of the poison; and we know that such persons may have the visceral diseases consequent upon ague, even passing on to their fatal termination without ever suffering a paroxysm of intermittent; showing that these results are to be ascribed rather to the action of the poison than the actual development of ague. Whilst, therefore, there is any enlargement of the spleen or liver, or any tendency to derangement of the alimentary canal, and the patient continues weak and retains the sallow aspect, and does not regain his appetite, we cannot regard him as altogether secure from the dangerous sequels of the disease.

In general there is no great difficulty in the diagnosis of ague; the only diseases with which it is liable to be confounded being hysteria, hectic, and febrile paroxysms arising from certain local irritations; hysterical females occasionally experience attacks of shivering, followed sometimes by a hot and even a sweating stage; but these paroxysms are so irregular as to their recurrence and their progress, that the knowledge of their liability to recur, is sufficient to prevent their being mistaken for ague.

Hectic fever often simulates a quotidian, and sometimes, though rarely, a tertian; but there is this difference, that in hectic the cold stage is very slight, sometimes altogether wanting; there is a liability to transient feverishness at all times, with a pallor of the countenance displaced occasionally by a circumscribed flush, very different from the sallowness produced by the ague miasm. In hectic, too, the shivering, when it occurs, generally comes on towards evening, and the sweating in the morning; in this respect also differing from what has been before stated to be generally though not uniformly the case with regard to the time of invasion of a quotidian paroxysm. The existence of suppuration in some part, and the rapid emaciation, are additional diagnostic circumstances in hectic.

Severe rigors, followed by heat and sweating, are also induced by stricture of the urethra, diseased prostate, and the passage of calculi along the gall-ducts or ureters; and these paroxysms, though irregular in the periods of their return, so closely simulate those of ague, that the possibility of the existence of one of these causes ought always to be carefully inquired into.

In the treatment of intermittent, as of all idiopathic fevers, we must bear in mind the tendency to spontaneous recovery, when the immediate cause of the disease has been eliminated; and therefore one of the first things to be done, where it is possible, is to remove the patient beyond the sphere of the malarious poison. It is also found by experience that anything producing a considerable impression upon the system at large, or strongly affecting the mind of the patient, will have the effect of preventing a paroxysm or greatly lessening its severity: for this purpose, emetics have often been beneficially employed: the ordinary emetic* (F. 93) may be administered, or half a drachm of sulphate of zinc given in the same way, before the time of the expected paroxysm. The application of tourniquets, so as to arrest a considerable portion of the circulation, has also not uncommonly prevented or diminished the paroxysm. And the same result has even been produced by swallowing some cobweb or a live frog.

The treatment of ague may be divided into that during the paroxysms, and that in the interval; and upon the principles already laid down, we must perceive that the former can be merely palliative, and that the latter should be directed towards removing or counteracting the cause of the paroxysm.

During the cold stage the patient should be placed in a warm bed, with warm pans or bottles of water; he may be allowed the free use of warm drinks, and if he be not of a plethoric habit, moderate stimulants, as negus or white-wine whey, may be used in order to promote reaction, and shorten the cold stage. It has been recommended to bleed during the cold stage, a practice eminently dangerous, and based upon the mistaken idea that the congestion in the internal organs is the cause and not the effect of the diminished force of the heart's action.

In the hot stage the coverings should be diminished, and cooling drinks, as lemonade or common effervescing saline draughts, administered, or compound infusion of roses with a little nitre. It is during the hot stage that opium has been found particularly serviceable, unless contraindicated by well-marked local inflammation or congestion. Twenty or thirty minims may be administered, and will generally have the effect of speedily inducing a profuse perspiration. Bleeding in this stage, though it may give some temporary relief, is not to be recommended, since by impairing the powers of the patient, it counteracts the treatment which is to be adopted in the interval.

In the sweating stage there is no occasion for any treatment beyond care to avoid checking the perspiration by premature exposure.

It is during the intermission that remedies are to be employed to eliminate the poison or counteract its effects, and prevent the return of the paroxysm; and for these purposes, the latter more especially, tonics have been found efficacious. Of these, the most important and most generally employed is Peruvian bark, or its alkaloid, the quina in the form of one of its salts. There are two ways of administering these drugs—the one is by giving a full dose shortly before the expected paroxysm, when it will often have the effect of preventing its occurrence altogether. This practice is often recommended in the ague districts as curing the disease with the least possible expenditure of quina or bark; it has, however, the disadvantage of the cure being not often permanent, the paroxysms returning after the lapse of several periods. When, however, we are particularly desirous of preventing the occurrence of a paroxysm which is near at hand, twelve grains of sulphate of quina may be administered, or, as some recommend, half an ounce of powdered bark, though the latter is more offensive to the patient.

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* (93) ℞ Pulv. Ipecac. ℈ j.
Antim. Pot. Tart., gr. i.
Ft. Pulv. Emet.

The most efficient means of counteracting the effect of the poison, is to administer the bark or quina in divided doses, throughout the intermissions. The most convenient form is to give the sulphate in doses of from two to four grains every three hours, the dose being greater for a quartan than a quotidian. Some writers rather fancifully recommend two grains for a quotidian, three for a tertian, and four for a quartan; the dose may be increased should there be no complication contra-indicating it, and should the paroxysm not be delayed or mitigated.

Another most important remedy, which has been known to succeed when bark and quina have failed in removing an ague, is arsenic; the form in which it is most conveniently administered being four or five minims of the liq. pot. arsenit. of the Pharmacopœia, three or four times a day, as many of tincture of opium or a drachm of syrup of poppy being added, in order to prevent griping or irritation of the bowels: but should the bowels by this means be confined, the use of a gentle laxative, such as about two drachms of castor-oil, will be preferable to withdrawing the opiate. The dose of the arsenic may be cautiously increased. Should redness of the conjunctivæ or other signs of an over-dose be perceived, the remedy should be immediately withdrawn, or the quantity diminished. Most authors recommend that the arsenic should be administered during the intermission; but Dr. Pereira states that he has repeatedly used it with good effect during the paroxysm, and that it is not, like quina, contra indicated by the presence of inflammatory complication.

Arsenic is a tasteless remedy, which is not unimportant in the treatment of ague in children, and is, moreover, a cheap one, which is no inconsiderable advantage when we consider the great scarcity and almost necessarily limited supply of quina, and its consequent liability to adulteration; and take into account the numbers of a poor population who are frequently affected in ague districts. On the other hand, it must not be forgotten that arsenic is a poison, which quina is not, and that although it has been stated to be a tonic, there is little ground for supposing it to be so, beyond the simple fact of its stopping the paroxysms of ague and periodic neuralgia. Other tonics have been recommended for the cure of ague, though none can bear comparison with the above as to their power over the disease; from the vegetable kingdom there are the willow bark and salicine; the cusparia bark, which contains cinchonia; the acorus, or calamus aromaticus; the gentian, &c.: and from the mineral, zinc and copper, the former of which has perhaps hardly been tried as fully as it deserves.

But whatever be the remedy employed, it is to be remembered that the paroxysms after they have apparently ceased for a considerable time, will often return; generally upon a day on which one would have taken place had there been no interruption to their recurrence; and therefore it is necessary to continue the remedy for some time after the disease has apparently subsided.

There is no doubt that a loaded state of the bowels, or a congested condition of the liver, interferes with the beneficial effects of quina or arsenic; and therefore it is often expedient to administer a moderate mercurial purgative before commencing the remedy to be employed in the intermission, whenever there is the least suspicion upon this point.

The treatment of complicated ague must, of course, depend mainly upon the nature of the complication. We have already noticed the tendency to congestion in the liver and spleen, which is in some degree induced in all who continue long within the influence of the malaria, even should they not become actually the subjects of ague, but which is aggravated tenfold by the occurrence of paroxysms: therefore the occasional use of a mercurial purgative—*e. g.* three grains of calomel with twelve of rhubarb—is not only an almost necessary preliminary to the treatment of ague, but ought to be repeated every second or third morning, in those who have been long exposed to the poison. When diarrhœa is present it will in general be restrained, and the state of the alvine evacuations corrected by two grains of the hydr. cum. cret., with four of the pulv. ipecac. co., or eight of the pulv. cret. co., night and morning; accumulation in the intestines being guarded against by occasional doses of two drachms of castor-oil, or the combination of rhubarb and chalk, the lower bowels being emptied when necessary by injections of gruel; and it is to be observed that in all cases we shall gain nothing by the use of bark, but rather produce headache, thirst, and loaded tongue, if it be administered before these abdominal derangements have been removed; where there is much tenesmus with diarrhœa, the cusparia will be found a very useful preliminary to the exhibition of the bark. It is in such cases that the arsenic is peculiarly serviceable, not being likely to produce the same local irritation or general excitement that we may apprehend from the cinchona.

The enlarged spleen, which is so common a complication, or rather consequence of ague, will best be treated by moderate laxatives and local depletion, either by leeches or cupping-glasses, poultices and occasional blisterings, iodide of potass, and sometimes quina or bark; and by mercurial plaster, or the combination of equal parts of mercurial ointment and the compound iodide ointment, and, above all, by a rigid avoidance of exposure to the malarious influence.

This latter precaution is indeed essential in all cases of convalescence from ague, as is also the avoidance of damp atmosphere, getting the feet wet, and all those circumstances which induce a chill to the system. Besides this, gentle tonics, as the infusion of calumba or cascarilla, or even a grain of the disulphate of quina in infusion of orange-peel, with two minims of diluted sulphuric acid, may be administered twice in the day.

There is no disease in which prophylactic treatment is of more importance than in ague, and this remark applies more particularly to those who have been affected by it, since such persons, not merely during convalescence, but even through life, evince a tendency to the disease far beyond what is observed in others who have not been so affected; and therefore, not only should they be specially careful to avoid a malarious locality, but all who either have had the fever or have been exposed to the influence of its causes, or are liable to such exposure, should be careful not to place themselves in those circumstances which have been pointed out as rendering them susceptible of their influence. And those whose duties compel them, as it were, to set such circumstances at defiance, must use every precaution to counteract or diminish their agency; such, for instance, as never going out at night, or very early in the morning, unless compelled; and in the latter case not going out fasting; sleeping as far removed from the soil as possible; choosing, when it can be done, a situation screened by trees from that in which the poison seems most rife; avoiding all excesses, but living moderately well, or rather more generously than is the ordinary habit. Quina, in moderate doses, with the occasional use of a warm aperient, such as the compound decoction of aloes, is a useful safeguard for those who are travelling through an ague district, or temporarily residing in one.

Remittent fever arises, like intermittent, from malaria; and as met with in this climate is generally a modification of the latter, produced either by exposure to malaria in a concentrated or very active form, or by certain circumstances affecting the individual, and rendering him peculiarly susceptible of its action; as cold, heat, or vicissitudes of temperature, or some source of irritation, generally in the liver or intestinal canal, which by tending to keep up the febrile state, prevents the complete apyrexia of an intermission.

In some cases the invasion of a remittent is preceded by the ordinary premonitory signs of fever. It more commonly, however, commences rather suddenly, with chills, especially a feeling of coldness along the spine, sometimes actual rigors, depression of spirits, and anorexia, pain in the back and limbs, headache, or confusion of intellect. Febrile reaction then follows, marked by dry heat, flushing, thirst, increased headache, hurried respiration, a frequent, full, and sometimes hard pulse, dry, white, and furred tongue. There is also at the commencement of the reaction a sense of weight about the epigastrium, with a feeling of constriction, and even pain, increased most commonly by pressure, and often attended with nausea, and perhaps vomiting; symptoms indicative of congestion about the præcordial region. The urine is scanty and high-coloured; and the stools, for the most part, of a dark bilious character.

This state of active fever may continue for a very variable period; sometimes not so long as eight hours, at others fourteen or sixteen, when the symptoms gradually subside, and a greater or less amount of perspiration ensues, much as the sweating supervenes upon the hot stages of regular intermittent. After this the patient feels much relieved, but is never altogether free from febrile excitement, and after an uncertain interval experiences a recurrence of the febrile symptoms sometimes preceded by a cold stage, which is scarcely perceptible; at others by distinct chills, or even well-marked rigors.

This fever admits of many degrees of severity; from a chilliness felt once in the twenty-four hours, followed by slight febrile reaction, to a fever in which the remissions are so slight as to assimilate the disease to severe continued fever.

The cause of remittent fever has been already pointed out to be nearly the same with that of intermittent, the result being modified, either by a variety in the character of the miasm, or the state of the subject; and it is when the causes of both continued and intermittent fevers, are in most active operation, and also when there is the greatest tendency to abdominal derangement, that remittent is most commonly met with; namely, in the autumn and in places where, besides the ordinary malaria, there are the effluvia emanating from sewers, stagnant ditches, and receptacles of decomposing animal and vegetable matter.

So closely, indeed, does the remittent fever so excited often approach to typhus, that it may really become true typhus, and is perhaps, under such circumstances, capable of reproducing itself by contagion.

It is not difficult to form a diagnosis between intermittent and remittent fever; the greater difficulty, in some forms of remittent, and what is of more consequence to the safety of the patient, is to distinguish this disease from continued fever, to which, as we have seen, it may approach very nearly.

It is, then, chiefly by inquiring into the history of the disease, and watching its progress, that we can hope to discriminate between the two. If, for instance, the patient has been in a malarious district, if there be no maculæ to be discovered on any part of the body, and if the case occurs in the autumn, or at a time when intermittents are prevailing, we may generally find that the fever has a miasmatic origin, and will probably evince a remitting character, a suspicion which will be brought almost to certainty if upon careful watching we discover that at some time there occurs a chilliness, followed by increased pyrexia, relieved by sweating. On the other hand, as we shall presently see in continued fever, complicated with much gastric irritation, we often have that disease assuming the character of irregular hectic, somewhat resembling remittent; from which, however, it may be distinguished by the character of the evacuations, the circumscribed flush on the cheek, and the previous history of the disease.

In autumnal seasons following unusually hot summers, remittent fever, occurring in patients of debilitated constitutions, or already labouring under visceral disease, may sometimes prove fatal; but in general, as it occurs in temperate climates, it is attended with little or no danger, beyond the remote consequences which attach to it as a form of ague: indeed the remittent fever of such climates may be said to be dangerous only in proportion as the season and circumstances under which they occur approach to those of intertropical countries, where there is a rapid production and decay of vegetable matter, and the system is rendered peculiarly susceptible of malarious poison, by the depressing influence of an almost vertical sun; and where the remittent fever is at all times a severe and often fatal disease, but peculiarly dangerous to Europeans lately arrived from temperate climates.

We have already spoken of the importance of the distinction between continued and remittent fever, and towards assisting in the diagnosis, the treatment may often be made subservient. The first object in the use of remedies should be, where the remission is obscure, to render it more distinct; and where it is tolerably so already, to convert it into an intermission. This will generally be effected by removing the irritating cause which has converted the intermission into a remission: therefore, the first thing to be done is, to explore carefully the abdomen, and, if there be pain and tenderness in the region of the liver, tenderness or flatulence of the bowels, our remedies should at once be directed to those organs. Where the tenderness of the spleen or liver is great, and there is tolerable firmness of the pulse, a small quantity of blood may be taken by cupping, or by a few leeches, from the region of the affected organ; but, as a general rule, unless the inflammatory symptoms be decided and severe, it is better to await the effect of a moderate laxative, such as may have at the same time the effect of correcting the secretions into the intestinal canal.

For this purpose, the best will be about five grains of hydr. cum cret., followed, in four hours, by three or four drachms of castor-oil; or if the oil would be likely to offend the stomach, the combination of calomel and rhubarb may be employed. When the bowels are very irritable, about two grains of hydr. cum cret. with six of pulv. cret. co., may be given two or three times daily; and if it be thought necessary to remove offending matter from the lower bowels, a pint of gruel may be given in the way of glyster. It will ordinarily happen, after the use of these remedies, that the remissions will become more distinct, or be converted into well-marked intermissions. Indeed, it is no very uncommon occurrence for cases brought into the wards of our hospitals, closely resembling continued fever, to put on a distinctly remittent or intermittent form after the action of a laxative, such as has been recommended above. So important, indeed, are means for removing local irritation, that they will often have the effect not only of establishing an intermission, but even of removing the fever altogether.

Cases have already been mentioned in which the intermission appears to have been prevented, and the febrile state kept up, by impure air, and effluvia from decomposing animal matter, and it may be by the contagion of continued fever; in such we often find the removal to a purer air, as from a confined dwelling to a ward of an hospital, speedily has the effect of bringing back the intermitting character. After the more active fever has been subdued, and the causes of local irritation removed, mucilaginous drinks and salines, as the liquor ammon. acetat. or citrate of potash, may be employed, under which treatment the remissions will gradually develop themselves into intermissions, and the disease may be treated as an intermittent; though even before this, when the remissions are considerable, and particularly in debilitated subjects, we may venture upon the use of the quina, even when a somewhat loaded tongue, with increased frequency of pulse, would, under other circumstances, contra-indicate its employment.

CONTINUED FEVER.

There are several forms of fever which, according to strict nosological arrangement, ought to come between the intermittent, the remittent, and the continued fever; yet as these three constitute, in a measure, the typical forms of fever, or at all events those which are generally regarded as standards of comparison by medical men in this country (owing, perhaps, to their greater familiarity with them), we proceed at once to the consideration of continued fever, more for the sake of practical convenience, than in accordance with any system.

As regards continued fever itself, it has been the custom to speak of varieties of this disease; and the same is common both with the profession and the public: thus we hear of typhus, putrid, bilious, nervous, and brain fevers; and more technically, if not more scientifically, of adynamic, atonic, mucous, gastro-enteritic, &c. Yet, notwithstanding that continued fever does assume these different phases, and notwithstanding that an attempt has of late been made with much ability to prove that there are at least two forms of it, arising from distinct poisons, it will be found most convenient for practical purposes to follow the course indicated by Dr. Watson, of including different forms under the general term of continued fever, and treating of them as varieties or complications of that disease.

An attack of continued fever does not always commence in the same way: in a large number of cases there is a previous drooping, or sinking of health, going on for days, or even weeks; the patient feels languid, indisposed for his ordinary employments or amusements; his appetite fails, his tongue becomes white or creamy, his bowels irregular, and his senses are often less acute; he is anxious, or drowsy, it may be, in the daytime, his sleep is disturbed, and he wakes unrefreshed in the morning.

In a large number of cases, however, these premonitory signs are altogether wanting; the patient is more suddenly attacked; often there is at first shivering, sickness, severe headache, or pain in the back, and in some cases the disease has commenced with syncope; there is also a state of general oppression, with the appearance of which every one must be acquainted who has made several visits to the bedside of a patient in this early stage of the disease; the tongue is either covered with a white fur, or there is a brownish streak, cleft in the middle, running along the dorsum; the pulse is commonly frequent, but compressible.

This stage of oppression passes more or less quickly into a state of fully-developed fever. The skin becomes hot, often for a day or two pungently so, particularly in children; the pulse more frequent, fuller, and sharper, ranging generally from 100 to 120; the tongue is commonly injected at the tip and edges, furred towards the centre, with a disposition to become dry, and there is increased thirst and clamminess of the mouth: there is also increased oppression, and pain in the head, back, and limbs; and we see more fully marked the depressed and desponding, yet at the same time almost apathetic countenance, characteristic of continued fever. The conjunctivæ are injected: there is also commonly a weight and tenderness on pressure at the epigastrium; the bowels are, at this period, generally torpid, though sometimes irritable, and the urine is scanty and high-coloured; there is restlessness, and sometimes delirium at night.

It is often at this period of the fever, or it may be later, that an eruption shows itself, either in the form of lenticular, slightly elevated, rose-coloured papulæ, or less elevated, and more irregularly shaped maculæ, generally showing themselves first over the breast and abdomen, or commencing first about the insertion of the pectoral muscles; though in slighter cases the eruption is altogether absent.

In the milder cases, and under careful treatment, and sometimes without any treatment at all, these symptoms will gradually subside, leaving the patient feeble, and generally with more or less loss of flesh; the convalescence commencing sometimes as soon as the tenth day, and in children even earlier, but in adults it is not generally fairly established before the end of the second, and sometimes the third week. Sometimes, however, the disease assumes a severer form, either suddenly, when the progress had hitherto appeared favourable, often without any assignable cause, but at other times from injudicious management; or it may from the first evince an almost malignant character.

In a large number of those cases in which the fever unexpectedly assumes the severer type, the unfavourable symptoms show themselves from the seventh to the tenth day, or even later, about the time at which, in the milder ones, we may expect to see some signs of amendment,—the countenance becoming more anxious and shrunken, the tongue dryer, the fur, which had before been drab-coloured, becoming brownish, and assuming more the character of a coating, the pulse quicker and sharper, but at the same time more compressible; and the patient, who before might have lain indifferently on either side, remaining in a supine position.

The delirium which, if it existed before, was confined to occasional wandering on waking from sleep, becomes almost constant through the night, and sometimes continues during the day; or there may be stupor, from which the patient is with difficulty roused, though, when thoroughly so, he gives a short but pertinent answer, but soon relapses into his former stupid state or begins to talk incoherently, and continues muttering to himself.

The senses, especially those of sight and hearing, become more or less disordered; often there is apparently dimness of vision, but not unfrequently an obvious intolerance of light; the same is true also of hearing; there is frequently deafness, but on the other hand, intolerance of sound is not uncommon; and even as regards feeling, there is often an exaggerated sensibility to touch, though this is more common, perhaps, in the commencement of the disease, and is not confined to the severer cases. The debility continues to increase, showing itself, as regards the nervous system, by tremors, and twitching of the limbs, and of the tongue, which sometimes is protruded with difficulty, and sometimes is quickly thrust forward and drawn back again for many times in succession. The tongue itself is red, clean, and glazed, or otherwise of a yellowish brown, or even almost black colour; the cheeks also become occasionally flushed, the bowels are generally loose, though at times there may be a tendency to constipation.

This state of things may continue for even two or three weeks, the pulse becoming smaller and more frequent, the tongue darker and dryer, the alvine evacuations passed unconsciously, and though the urine is retained, there may be at the same time a dribbling from the distended bladder; the pulse becomes more frequent and feeble, though it may almost to the last retain a certain degree of sharpness, or, though small, it has a slight back-stroke; and ultimately the patient sinks from asthenia. Or on the other hand, it may happen that the fever subsides; or in other words, the morbific influence of the poison upon the system ceases to operate; or the poison itself being eliminated, sometimes with copious evacuations, the capillary circulation is relieved, the secretions are restored, the tongue becomes less dry and cleaner, and the pulse soft, often full, and rather slow, and the patient, though in a state of great exhaustion and emaciation, begins slowly to recover.

" In other cases, the change from the milder to the severer form of fever takes place more suddenly, and with signs of great nervous excitement, but at the same time of great debility. The patient becoming furiously delirious, the eyes red and fiery, the skin hot, and the countenance flushed; or there will be incoherent talking or muttering, the patient remaining for a time quiet, and then speaking rapidly and in a rambling way about his business, or whatever may be supposed to have been uppermost in his mind at the time of the attack; at other times he will moan piteously, or utter plaintive cries, there will be picking of the bed-clothes, tremor, or subsultus of the muscles, and the tongue will be protruded tremulously and with difficulty: the tongue itself being coated with a thick, pitchy mucus, which dries and cracks, and often causes great pain to the patient: this mucus adheres also to the teeth and lips, and seems to glue them together, extending also to the fauces, and probably likewise to the glottis, often exciting a teasing cough. The urine is very high coloured, and sometimes tinged with grumous, dark blood; the bowels are sometimes confined, though at others relaxed, the stools loose, dark, and offensive. This state of things may continue for several days, the patient appearing all the time upon the verge of dissolution, after which a slow amendment commences almost imperceptibly, though in a few cases, a sudden change takes place for the better on the supervention of a copious discharge from the skin, the bowels, or kidneys."*

In a considerable proportion of cases, however, the prostration increases, and the patient remains supine, and sinking lower and lower in his bed, continually muttering, but apparently insensible. Sometimes a sudden hæmorrhage takes place, either from the bowels or by the urine, or the disorganized state of the red corpuscles allows the solution of the colouring matter in the serum, and its consequent transudation through the cutaneous vessels, producing purple or livid patches, and the patient ultimately sinks exhausted.

In the forms of severe continued fever which have just been described, the more dangerous symptoms have been supposed to supervene upon those of the milder, but many cases are essentially of a severe and malignant character from the first; or speedily become so, either from the previous constitution of the patient, as when it has been impaired by exhausting diseases, fatigue, intemperance, venereal excesses, or protracted anxiety or distress of mind. It may be well here to observe, that, amongst the mental causes affecting the character of fever, there is reason for believing that a certain state of excitement induces a state of the nervous system in which delirium, attended with exhaustion, supervenes early in the course of the disease, which is prone to run its course with unusual celerity and violence. Cases of this kind occur most frequently amongst the more highly-educated classes.

In other cases, again, either the poison producing the disease, is concentrated, or the patient rendered peculiarly susceptible to its agency by external circumstances, or its effects are aggravated by mismanagement. These are the cases commonly known as malignant, or putrid fever, and are most frequently met with in the confined habitations of the poor, especially in crowded cities, where, besides the depressing effects of noxious effluvia, we have the concentration of the poison from the crowding of several infected persons in the same apartment, often in the same bed; superadded to which there is sometimes the perverse precaution of carefully excluding the air, sometimes the premature administration of stimulants, and now and then the no less pernicious misuse of depletion. Under such circumstances, we have the effects of change, almost of decomposition of the blood, combined with irritation and speedy exhaustion of the nervous system; the former are shown by the early appearance of livid petechiæ or vibices, and the excretion of dark blood from the bowels or bladder; and the latter by early delirium, speedily followed by coma or stupor. Such is the course of continued fever, viewed irrespectively of the complications or local hyperæmias to which it very frequently gives rise, and without which it may prove fatal by sinking or asthenia, apparently from failure of the moving powers of the circulation, brought about conjointly by the depressing agency of the poison upon the nervous system, and the loss of the healthy affinity between the blood and the tissues.

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* 'Elements of Medicine.' Bright and Addison.

The complications just alluded to are, however, particularly worthy of notice, as when they occur, which they very frequently do, they greatly influence the course of the disease, and ought proportionately to modify our prognosis, and also our treatment; and a further reason why they deserve to be carefully looked for upon all occasions is, that in certain epidemics particular complications appear to prevail, so that having observed cerebral complication to occur in several cases at the breaking out of an epidemic, we may be prepared to expect its recurrence in others.

Fever with predominant cerebral complication.—One of the most dangerous and not the least frequent of the complications of continued fever, is lesion of the brain and its membranes. That the brain is always one of the parts principally affected, we have already seen; though of the precise nature of this affection we may be said to be nearly ignorant, and are therefore justified, in the present state of our knowledge, in regarding it as the direct effect of the poison upon the nervous system; and there can be no doubt that death may ensue from this cause without any evidence of inflammation after death; and though it is attended with much excitement, the symptoms during life are widely different from those which characterize true inflammation within the cranium.

Still, it is no less true that inflammation of the brain or its membranes, or of both, does frequently occur, as shown alike by the symptoms during life, and the results of dissection after death. There is intense pain in the head, with a slow, or oppressed pulse, which is speedily followed by great restlessness, incessant talking, and, though rarely, furious delirium, the pulse rising, and becoming frequent, and rather sharp, but generally compressible, the tongue brown and dry, and the skin hot; the eyes become suffused, and there is increased susceptibility to light and sound. This state of things may come on at any period of the fever, but when it shows itself early, is always of fearful omen: indeed, as a general rule, *early delirium is a most unfavourable symptom in fever, more particularly in adults*, since children may have a certain amount of wandering at almost any period of any febrile disease.

The delirium under such circumstances is less violent than in ordinary inflammation of the brain, and indeed here, as in all cases of inflammation occurring in fever, the symptoms of languor and prostration supervene rapidly upon those of excitement; the tongue becomes brown and dry, the pulse, though frequent and sharp, is compressible, there is a dull, staring eye, feeble voice, subsultus tendinum, and, unless these symptoms subside, we have moaning and muttering, with feeble cries, the head being rolled about in evident distress; afterwards cold clammy sweats break out upon the surface, the urine and stools are passed unconsciously, the pulse becomes more and more feeble, and the patient either passes into a state of hopeless stupor, or sinks exhausted. The appearances after death are such as indicate inflammatory action, though hardly fully-developed inflammation. There is increased vascularity, as shown by the appearance of bloody points from divided vessels in the substance of the brain; and sometimes, though rarely, there is softening. As regards the membranes, there is increased injection of the pia mater, with sub-arachnoid effusion, the latter membrane being often opaque, and there may be effusion into the ventricles.

In other cases, again, the poison seems to act more particularly upon the *respiratory organs*, especially the lungs and bronchial membrane, causing congestion of a more or less active character, and subsequently inflammation of those organs. Complications of this class are more frequent in the winter months, but they may occur in fevers at all periods of the year. When the bronchial membrane is the tissue principally affected, there is, early in the disease, weight and oppression of the chest, dyspnœa, often an appearance of congestion about the countenance, and sometimes a tendency to lividity of the extremities; the tongue is generally dark at the edges; the pulse, which is sometimes sharp, is almost always quick and feeble: and there will in the commencement be, the dry, sibilant, or wheezing sound of congestion or turgescence of the bronchial membrane: this, in most cases, is followed by expectoration, and other signs of bronchitis; though it sometimes happens that the inflammation, if such it be, stops short at the stage of congestion, and subsides with the subsidence of the general fever.

The complication of pneumonia is by no means unfrequent, perhaps less so than is commonly supposed, from the circumstance that, unless attended by bronchitis, it is liable to be overlooked. The fact of pneumonia being often latent is one of great importance generally, but it is especially so in reference to the treatment of fever; and for its discovery, or at all events for its distinct announcement, we are indebted to Dr. Addison. There being neither cough nor expectoration, and sometimes but little excitement of the respiration, often not more than we ordinarily meet with in fevers, it is only by auscultation that it can be detected, though, when deeply seated and uncomplicated, it may escape even this means of diagnosis. The *post-mortem* appearances are the same as those observed in the ordinary forms of pneumonia already described, with the exception, perhaps, that there is a greater tendency to the effusion of serum in the substance of the lung. Care is to be taken after death to distinguish the hypostatic congestion occurring towards the termination of fever, sometimes during the last agony, from that produced by true pneumonia, and the same should be observed during life; for it not uncommonly happens that, when a patient has for a long time been prostrate on his back, in a low form of fever, if he be raised, and the stethoscope applied to the back of the chest, the first few inspirations will be attended by a sound closely resembling the dry crepitation of early pneumonia; though after the repetition of several respirations it will cease.

Perhaps the most frequent complication of continued fever, and one, which on that as well as other accounts, deserves most careful attention, is irritation and inflammation of the mucous membrane of the alimentary canal. That there is derangement in the upper part of this membrane is apparent from the state of the mouth, and it is not uncommon, especially at an advanced period, to see the tongue very red and morbidly clean, or even glazed; and at the same time, there may be great tenderness at the epigastrium, with nausea and vomiting, which last is not unfrequently a very troublesome symptom, indicating irritation, or even inflammation of the mucous membrane of the stomach, which is sometimes found on inspection after death.

The part of the intestinal mucous membrane, however, which is most frequently and peculiarly affected, is that belonging to about the lower third of the ileum. The whole of the lining membrane of the small intestines may indeed participate in the inflammation, and here and there spots of lymph may be seen upon its surface, but it is in the portion above mentioned that the principal lesion is found. In this part of the canal there is often an increased vascularity over the whole of the surface, and in almost all cases irritation seems to be most intense in spots which appear, upon closer examination, to have been occupied by the small mucous glands of Peyer and Brunner, so that they are sometimes solitary, and sometimes as it were set in clusters.

The ulceration is generally preceded by some effusion of lymph on the surface of the mucous gland, but what is characteristic of the affection, is that the gland itself becomes the nidus of an interstitial deposit. Either this matter breaks down, and involving the gland in its disintegration, an ulcer is formed by ulcerative absorption, though sometimes there may be sloughing of the membrane, or the deposit may be removed by interstitial absorption: sometimes, too, the peritoneal coat becomes involved; the escape of the contents of the canal, and consequent peritonitis, are the results. Another consequence of this ulceration may be the opening of one or more vessels of some size, from which hæmorrhage to a considerable extent may ensue. These ulcers are generally accompanied by injection and enlargement of the corresponding glands of the mesentery. The ulceration does not necessarily continue its process of destruction, since we often find the parts where it has been situated in the different stages of repair and cicatrization.

The symptoms which arise from the above affection of the ileum are, deep-seated tenderness about the right iliac fossa, and irritability of bowels, the stools being very loose and of a yellow-ochry colour; sometimes, however, this complication exists without diarrhœa. The pulse is frequent, rather small, and very compressible. The tongue is red at the edges with elongated papillæ, the centre generally brown and apt to become dry; sometimes it is glazed. The countenance is either pallid, or there is a distinct patch of redness on the cheeks, which disappears and recurs frequently in the day. The pupils are commonly dilated and the eyes bright: besides these symptoms, there is, to use the words of Dr. Addison, "a something in the aspect of the patient, and the general character of his symptoms, sufficient to apprise the attentive observer with tolerable certainty of the existing complication. However mild the case, there is usually a certain degree of nervousness, tremulousness, or agitation about the patient, sometimes almost amounting to subsultus, and especially manifest on attempting to make any exertion; he is dull and drowsy, with some tendency to stupor, but may, nevertheless, always be roused to understand and answer questions, even during the night, when the mental aberration is most considerable."

The patient may remain in this condition for several days, sometimes for weeks, and the diarrhœa subsiding, the evacuations become more consistent, and he recovers: the convalescence being generally slow, and the patient very liable to relapse upon any error in diet, exposure, or undue exertion. In other cases, again, the diarrhœa continues, the stools are passed involuntarily, the prostration and emaciation increase; there are frequent but irregular exacerbations, marked by the presence of the red patch above noticed; there is excessive restlessness, with picking of the nose, lips, or bed-clothes, and the patient dies of asthenia; or it may be that before the exhaustion proceeds to this extent, perforation of the intestine takes place, and he is carried off by peritonitis.

It is the above form of fever that is peculiarly exposed to the additional complications, if so they may be called, of *bed-sores,* produced by continual pressure on one part, from inability of the patient to alter his position; the effects of this pressure in arresting the nutrition of the part being increased by the generally defective nutrition, dependent partly upon the febrile state, and in the present case particularly upon the diminished or arrested supply of chyle, owing to the obstruction of the lacteals; the sores sometimes commence in superficial ulcerations, produced by irritation of the fæces and urine where the evacuations are passed unconsciously. These bed-sores are in themselves a serious evil, being productive of all the exhaustion known to be attendant upon the well-known "cellular membranous inflammations," and which must tend greatly to aggravate the exhaustion produced by the fever; besides which they prolong the febrile state, and deprive the patient of sleep by the pain and irritation which they occasion.

Intestinal hæmorrhage may ensue in the progress of fever, by blood oozing from the surface of the ulcers above described; or, as has just been noticed, it may occur to a very considerable extent, owing to a vessel of some size having been opened in the progress of the ulceration, and in this case it becomes highly dangerous. There may also be a general exudation of blood from the surface of the intestinal canal in those cases in which there is no ulceration, and in which there has been little or no diarrhœa, or other sign of bowel complication; in those cases, in fact, which are now specifically designated typhus.

The Pulse in Fever.—Few of the phenomena of fever are more interesting or more instructive than the state of the pulse; and by the indications which it affords, we are enabled, more than by any other class of symptoms, to regulate our prognosis and our treatment. One of the effects of the poison being upon the blood, the mutual affinity between that fluid and the tissues is weakened, and one of the moving powers of the circulation annulled or diminished, and consequently we find the heart labouring to propel the obstructed current; but in this instance we have not, in the ordinary fevers of this climate, the increased tonicity of the arteries which exists in inflammation (p. 69), and consequently the pulse is sharp and full, but never, except in inflammatory fever, hard. As the fever continues, the powers of the system, and consequently the contractility of the heart, failing, we have the pulse weaker and weaker, and at the same time as soft as at first, or even more so, from the diminishing tonicity of the arterial coats. Owing to the continued efforts of the heart and the persistent obstruction in the capillary circulation, there is not uncommonly a recoil to be felt, giving the sensation to the finger of a back stroke (p. 70). Another effect of the continuation of the obstruction to the extreme circulation, conjoined with the continually diminishing power of the heart, is, that the latter being unable to empty itself, and therefore continually exposed to the presence of its natural stimulus, is incessantly excited to contraction, the effect of which is great frequency of the pulse, which is often commensurate with its debility. With this state of the heart there may also be a tendency to the back stroke, and the result will be a kind of struggling or throbbing pulse, which is always a sign of imminent danger.

When there is a subsidence of the fever, whether brought about or followed by anything like a critical discharge, or otherwise—though it is to be observed that there is always a return of the secretions on its subsidence—the healthy relations between the blood and the tissues gradually returning, the obstruction to the current is in some measure diminished; and therefore the pulse loses its sharpness, and the ventricles of the heart being better able to expel their blood, it becomes also slower: but the diminished contractility of the arteries continuing, with the generally exhausted state of the system, the pulse is soft and moderately full: and as the convalescence becomes established, and the secretions abundant, the quantity of the blood in the system being probably diminished, the left ventricle empties itself fully, but is slowly refilled. The force of its contraction no doubt remains somewhat weakened, but the same is the case with the contractility of the arteries, so that they are equally balanced, and the result is a slow, very distinct, and moderately soft and full pulse. It may be well here to remark that the conditions of pulse which have been here somewhat theoretically referred to the different periods of fever, are fully borne out by experience; a quick and feeble pulse being that always met with in the advanced stages of continued fever, the pulse of convalescence being distinct and slow (sometimes below the healthy standard) and moderately soft and full.

Upon these grounds, but still more upon almost universal experience, the frequency of the pulse is of the greatest importance in fever; its not exceeding 100 is in general a favourable sign, when it exceeds 120 in adults the danger is great.

Maculæ in Fever.—Allusion has already been made to the eruptions in continued fever, and they are deserving of closer observation, since, if they do not in their different forms characterize essentially different species of fever, they certainly indicate a difference in the state of the circulation and of the system generally, which we ought never to overlook. There are two forms of maculæ upon the distinctive characters of which great stress has lately been laid as marking different diseases. The former, which we have spoken of as the rose-coloured rash, consisting of rose-coloured papulæ, disappearing under pressure of the finger; irregularly scattered over the surface of the trunk, generally but few in number, though sometimes, but very rarely, almost confluent. Each spot continues for about four days, but fresh ones are said to be continually appearing to the twenty-first or twenty-second day of the fever; these have been described by Dr. Jenner as characterizing a specific form of fever—the typhoid.

The other form of rash, which has been supposed to characterize the true typhus, consists of mulberry-coloured spots, at first slightly elevated, and rendered much fainter, though not entirely disappearing when moderately pressed upon; but afterwards they assume a more livid colour, and are not so much altered by pressure. These spots either fade into brownish stains and then vanish, or pass into decided petechiæ or small ecchimoses; each spot continuing from its first appearance to the termination of the disease. The general hue of the skin is, during the presence of this rash, rather dusky and mottled, constituting what has been termed the sub-cuticular rash.*

The question of the distinction of typhus and typhoid fever, as arising from distinct poisons, and distinguishable by eruption, is one that has been some years under discussion: thus Dr. Alison, writing at least as early as 1844, states that "An opinion has lately become rather prevalent that there are two kinds of fever, to which the names of typhus and typhoid fever have been given; of which the first, usually unconnected with any affection of the mucous membrane, is attended with the eruption, and is more contagious; the latter is necessarily connected with inflammation, going on to ulceration of the mucous membrane, is unattended with eruption, is more protracted and has little contagious property. This term typhoid fever is to be regarded as synonymous with gastro-enterite and dothen-enterite. If it be understood that the intestinal inflammation in this last case is of specific character, this doctrine can have no injurious results; but it is certain that some cases resulting from the contagion of the usual spotted typhus show all the symptoms and post-mortem appearances attributed to typhoid fever; and therefore it seems probable that the differences observed are only varieties depending upon constitution, and on the agency of other causes affecting the constitution, besides the existing cause of the disease."* The observations of Dr. Jenner are not indeed open to the practical objection of regarding any form of fever as synonymous with gastro-enteritis; yet it is remarkable that so careful and candid an observer as was the late Dr. Alison, should have deliberately recorded as his experience the occurrence of the gastro-enteritic symptoms and post-mortem appearances in cases which have undoubtedly been the true spotted typhus, both in their origin and in the character of the rash.

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* For a very careful description of these rashes, see Dr. Jenner's paper in the thirty-third volume of the 'Medico-Chirurgical Transactions.'

The conclusions which it appears that we may most legitimately draw from our present information upon the subject are, that in the fevers in which the mulberry-coloured and livid spots are present there is a greater tendency, than in those where there is the rose rash, to assume the low, sinking type, and perhaps a greater liability to head affections, whilst the bowel irritation with the typhoid deposit in the lower portion of the ileum is very rarely observed; though, speaking from our own experience as well as from the recorded observation of others, we are not prepared to say that it is invariably absent. Where there is the rose rash, on the other hand, there is almost always great bowel irritation and not such early depression from the effects of the poison, whilst in fatal cases the affection of the ileum has, as far as we are informed, been invariably found when the alimentary canal has been carefully examined after death.

Whilst, therefore, we hesitate to affirm that these two varieties of fever, the typhus and the typhoid, are essentially different, and owe their origin each to a distinct specific poison, we in no wise dissent from the practical inferences to be drawn from the distinction between the two. We adopt, however, with some reluctance the term typhoid as applied to the latter, not from the word itself being unfitted to express the character of the disease, but because it is one which has long been current among medical men in a different sense, and we are therefore sensible of the inconvenience of thus restricting it, and we can hardly suppress our regret that another has not been chosen for this purpose. But for this objection the fever with the rose rash might well be called typhoid, as like typhus, but in many respects differing from it. Though there are points of resemblance between the two in the symptoms during life, there are also, as we have seen, important differences, the fever in the typhoid variety commencing more insidiously and its course being more protracted. According to Dr. Jenner fresh spots may appear as late as the thirtieth day. In both in their less complicated forms the mode of death is from asthenia; but in typhus this asthenia is from the direct effect of the poison acting it may be through the blood upon the waning powers of the circulation: in the typhoid it is from the continued exhaustion produced by the bowel irritation, or from the depressing effects of peritonitis produced by perforation of the intestines.

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* Alison's 'Pathology and Practice,' pp. 446, 447.

There are also striking points of resemblance and marked differences in the appearances after death. In both there is no morbid condition of the brain invariably present, but in both there may be a purpuric condition of that organ. In both the heart is flabby, though in typhus the blood in its cavities is fluid, whereas in typhoid there are coagula, though less firm than those ordinarily found. In both the lungs are congested, especially posteriorly, with patches of hyperæmia, sometimes passing into pneumonia. In typhus the liver is soft, whereas in typhoid it is generally healthy. In both the spleen is enlarged. It is, however, in the intestines and on the surface of the body that the remarkable differences present themselves. In typhus there are no characteristic morbid changes in the intestines; in typhoid there are the changes already described in the mucous follicles; and sometimes perforation producing fatal peritonitis. In typhus, when there is hæmorrhage, it is in the form of an exudation from the surface of the alimentary canal; in typhoid it is from vessels which have been opened in the process of ulceration. In typhus the body is still covered after death with petechiæ which had existed during life, as the mulberry rash; in typhoid there is none, except the occasional presence on the extremities of small purpuric spots.

In the description of typhus and typhoid fever we may have in some points withheld our entire assent to the opinions of Dr. Jenner: but we by no means withhold our admission of the practical value of his observations, or of the accuracy and industry which he has brought to bear upon the subject.

Different in many of its symptoms, and, according to some, different in its origin, from either typhus or typhoid fever, is the relapsing fever, which is perhaps the fever vulgarly called bilious fever. It commences, in most instances, rather suddenly with rigors, followed by heat and dryness of the skin, severe headache, much pain in the joints, rapid pulse, moist tongue, with a thick creamy fur. This form of fever appears to affect mainly the upper part of the alimentary canal and the liver, there being tenderness at the epigastrium, nausea and vomiting early in the disease, though the bowels are not much disturbed, and there are also yellowness of skin, or even jaundice, and coffee-ground vomiting: minute purpuric spots are also to be seen in the greater number of cases of relapsing fever. About the fifth, seventh, or ninth day, a crisis appears to take place: a copious perspiration breaks out, the skin at the same time becoming covered with sudamina. The pulse then subsides, and convalesence appears to be commencing; but from the fifth to the eighth day the rigors recur, and there is a renewal of the fever, running indeed a shorter course than before, and again terminating in sweating. These relapses occur three or four times.

This fever is rarely fatal; and it is remarkable that there may be a much greater frequency of the pulse without great danger to the patient than in the other forms of continued fever.

This fever hardly seems strictly to belong to the class of continued fevers, the intermission and recurrence suggesting a belief in its relation to ague; and in some of its symptoms it certainly approaches nearly to the intermittent of tropical climates. It has at times prevailed very extensively in Ireland, whence it is supposed to have been brought to this country. In 1847 and 1848, the years consequent upon the great Irish famine, it certainly affected a considerable portion of the working classes in London, English as well as Irish.

As regards the origin of continued fever, we have already expressed the belief that the disease is communicable from person to person, that is, that it is contagious: whether this contagion is the alone cause is a question that is not so readily answered. There can be little doubt that there are various circumstances, such as impurities of the atmosphere, arising from decomposing animal matters, neglect of ventilation and cleanliness in towns, and emanations from drains and cesspools, which greatly favour its propagation, so much so, that they sometimes appear to originate it: but no facts have as yet been adduced sufficient to overthrow the strong evidence in favour of the spread of continued fever by contagion. This remark, however, applies more strictly to the true typhus than to the typhoid, so much so, that an opinion has been expressed that the former owes its origin to a human miasm, and the latter to a drain poison. The spread, however, of the latter in hospitals, and amongst persons who have been removed from the local influences under which the disease had been supposed to originate, and its importation by infected persons in districts where it had not been prevailing before, can leave little doubt as to its being communicable, though it must be admitted that it is by no means so highly contagious as the true typhus, and that where ventilation is carefully attended to, and the sick are not crowded together, there is little danger of its extending. The relapsing fever certainly has much the appearance of a disease originating from marsh poison, the history of which seems to suggest the belief that it is generated by filth and starvation, but that it is capable of reproduction by contagion.

The diagnosis of continued fever is not always so much a matter of course as is often supposed, as there are several diseases with which it may be confounded, though in the generality of cases it is undoubtedly easy. The mode of the attack, the general oppression, with depression rather than excitement of the countenance, the frequent and compressible pulse, the vividly injected tongue, and in many cases the appearance of the eruptions, are sufficient to characterize the disease at once, not to mention the circumstance of a prevailing epidemic, or our knowledge of the sources of infection to which the patient may have been exposed.

Cases of difficulty do, however, not very rarely arise, and this difficulty results in the majority of instances from some local inflammation, generally of a chronic character; such are deep-seated suppuration, or chronic or subacute disease of the large intestines, mesenteric glands, or peritoneum, which will frequently give rise to symptoms nearly resembling those of mild continued fever, though upon closer observation the fever presents a more remitting character: whilst in the aged and persons of feeble constitutions acute inflammations will often assume the character of a more severe form of fever.

Pneumonia, and in its most simple form, may in persons of all ages assume the character of severe continued fever, so much so that it is only by a careful exploration of the lungs, and not always even by this means, that its presence can be detected. And the same thing occurs in some cases also of acute diffused tuberculization of the lungs. Puriform infection and poisoned wounds will also induce fever of typhoid character.

Prognosis of Continued Fever.—The prognosis of continued fever in this country, in persons young and of sound constitution, is in general favourable; in very young persons the fever often subsides at the end of the eighth day; in those more advanced in life it is more doubtful, and even unfavourable. Persons above sixty are not often the subjects of continued fever, but of those which are so attacked the greater number do not recover. Dr. Alison states that the mortality in persons above forty is as high as one in two. It is to be remembered, also, that although fever is most common in the dwellings of the lower orders, and that in such abodes the mortality is the greatest, owing to want of ventilation, and often also of proper care and nourishment; yet that when such persons are removed to more favourable circumstances, as to the well-ventilated wards of our hospitals, they more frequently recover than do those who become the subjects of fever among the higher and more educated classes of society: the reason of this being probably that there is in the latter case a greater excitability of brain, and therefore a greater tendency to subsequent exhaustion of the nervous power, or what may be still worse, a greater liability to inflammation of the brain or its membranes. Another circumstance to be taken into account is the general mortality in the prevailing epidemic, and more especially as it has occurred in the immediate locality. The previous impressions on the mind of the patient, again, are not to be overlooked, as it is always an unfavourable sign when he has at the commencement of the disease expressed a conviction that he shall not recover. For the same reason previous mental anxiety, or the having recently undergone losses of friends or fortune, or other severe disappointment, have an unfavourable influence.

As regards the general prognosis, we may also add that it should at all times be very guarded, for although mild continued fever very rarely proves fatal, still circumstances may arise in its progress which no human foresight can foretell or prevent, and therefore though it is very true in fever, even of the severest form, that "whilst there is life there is hope," it is no less true that "*whilst there is fever there is danger.*"

In young persons the milder form of this disease will often terminate favourably in eight or ten days, and in such subjects we may about that time look for signs of its subsidence:—namely, a diminished frequency of the pulse, a softer and cooler skin, with perhaps a little moisture upon it, the disappearance of the expression of languor and anxiety, a cleaner tongue, and an increased flow of urine, the return of sleep, and subsidence of all signs of irritation or disturbance about the brain.

In the severe cases, which may be expected to run on for about three weeks, a rational prognosis is to be founded upon the consideration of the sources of danger, and the modes of fatal termination of fever; and the first symptoms of any of the conditions upon which they depend are to be regarded as dangerous.

Modes of fatal termination of Fever.—A most important step to a correct prognosis, and sound practice, in fever is, the right appreciation of its different modes of fatal termination. The earliest period at which fever may prove fatal, is in the stage of oppression from the first effects of the poison, or morbific agent, upon the system, either by its depressing the action of the heart and arteries so as to cause death from syncope, or so greatly reducing the powers of the nervous matter as to produce fatal coma at the first invasion of the disease; though the cause of this coma may not be made apparent after death by the presence of any effusion or perceptible lesion in the brain. To the above may perhaps be added early death from the general arrest of the extreme circulation, or what we have before spoken of as capillary or peripheral syncope.

These early terminations of fever are however not frequent, in this country especially, and consequently the real danger occurs at a more advanced period, and arises from more complicated causes. "It appears manifestly owing," says Dr. Alison, "to a combination of the enfeebled state of the circulation, with peculiar derangement of the functions of individual organs, consequent on the attendant inflammations there. In consequence of this combination, we have three distinct fatal terminations of fever which are often blended together, but in some cases are quite separate and easily distinguished." (1.) The death by *coma* referable partly to the peculiar action of the cause of fever upon the brain, but partly also to increased determination of blood thither, or inflammatory action there. (2.) The death by *asphyxia* (apnœa), referable partly to the enfeebled state of the circulation, and partly to the want of power in the heart to propel the blood through the lungs (and partly also to obstructed capillary circulation in these organs as a direct effect of the morbific agent), but partly also to bronchitis and pneumonia. (3.) The death by mere *asthenia*—referable partly to the deleterious effects of the morbific cause upon the circulation, but frequently also in part to various local inflammations prolonging the febrile state, and especially to the inflammations and ulcerations in the mucous membranes of the intestines, which appear to have in this, as in other cases, a peculiar sedative, and what was formerly designated as a sympathetic effect, on the heart's action."*

(1.) As regards death from coma or death from the brain, it is not at all common in the commencement of fever, though it *may* occur from the first effect of the poison upon the nervous system. It is more common, however, at a more advanced period; and generally, in the way of exhaustion coming on as a consequence of nervous excitement; and for this reason all symptoms which indicate early excitement are far more to be dreaded than those which show a sluggishness of the brain. Thus early delirium, especially if it be of an active character, is amongst the worst signs in fever. Intolerance of light is, for the same reason, unfavourable, and therefore a contracted pupil, which indicates a highly-sensitive condition of the retina, is always worse than a moderately full or even dilated one. Deafness is not unfavourable, but intolerance of sound decidedly so. A persistent delirium is always more likely to be followed by coma than where there are intervals of reason, and the delirium is a still worse sign when the patient is continually talking upon the same subject, especially if that be one in connection with which there is reason to believe that his mind may have been powerfully affected. Continued sleeplessness is, in the same way, a far worse symptom than drowsiness, unless there be reason to apprehend that the latter be the result of effusion; in which case, however, it will have been generally preceded by active excitement; indeed, many of the more uneducated of the fever patients in our hospitals seem, as it were, almost to sleep through their fevers. Greatly increased heat of the scalp, and throbbing of the carotid arteries, are also unfavourable, as indeed are also signs of inflammation of the brain or its membranes. It is perhaps on this account that there is much truth in the observation of Hippocrates, that convulsion occurring in the course of a fever is worse than fever supervening upon convulsions. Tremor of the limbs and tongue, inability to retain the fæces or urine, picking of the bed-clothes, and subsultus tendinum are among the symptoms of threatened death from coma. As regards the urine, however, the inability to empty the bladder is as likely to be the cause as the effect of the cerebral affection.

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* Alison's 'Outlines of Pathology Practice,' p. 444.

(2.) Death from the lungs or death from apnœa may ensue at any period of fever, and may take place almost at its onset from the effects of the morbific agent in obstructing the circulation of the blood through the capillaries of the lungs. This is not a very common occurrence, and belongs to the congestive form of fever when very severe. It is threatened when there is early lividity with a very small pulse and shrunken, livid, cold extremities, with duskiness of the lips and countenance, hurried and oppressed breathing, but without pain; with a skin generally cool, often moist, and scanty urine. Such cases, when they do occur, are always very dangerous. Death may also ensue in this manner when there is at the same time (as in the more advanced stages of the disease) a tendency to fatal termination by asthenia, owing to failure in the action of the right side of the heart. And on this account the symptoms of pulmonic congestion occurring in connection with those of sinking are most unfavourable. Death from apnœa may also take place from bronchitis or pneumonia occurring as a complication of the fever; and the existence of either of these to any extent increases the danger of the latter. Bronchitis often exists in the congestive form, accompanied by sibilant respiration, and with no increase but even a diminution in the secretion of the membrane, and therefore unattended by any mucous rattles, the pulse becoming feeble, the countenance, lips, and extremities congested, and sometimes livid. When the latter is the case there is great danger. The same condition may also arise from excessive secretion blocking up the tubes and preventing the aeration of the blood in the lungs, as in the case of asthenic bronchitis; and this is perhaps a fatal termination more common than that by congestion of the bronchial membrane; and for this reason very extensive mucous rattles, especially if pervading the small tubes, are unfavourable. This result may arise from pneumonia, the presence of which, therefore, greatly adds to the danger of fever. It must also be remembered that fever has a tendency to reproduce inflammation where it has formerly existed, and therefore that a previous attack of pneumonia, especially if it have left any consolidation or induration of the lung, greatly adds to the danger of fever.

(3.) As regards the death by syncope or asthenia, it is by no means a common occurrence in the early stages of fever; still cases are to be met with in which there appears to be considerable danger from the early failure of the moving powers of the circulation; the signs of which are a very feeble and generally very quick pulse, with coldness and a tendency to lividity in the extremities; and it is also to be borne in mind that, in all periods of fever, death from syncope may occur from the neglect of proper precaution against such a possibility.

It is, however, in the more advanced stages of the disease, generally after the completion of the second week, that death from the more protracted form of syncope, *i. e.*, from asthenia, arising out of the combined effect of diminished, or rather arrested, nutrition, and failing of the heart's action, is to be apprehended. The pulse becomes small, weak, and frequent, and very compressible: though in some cases, especially in persons advanced in life, it may appear moderately full, even when there is imminent sinking, owing to the obstruction in the extreme circulation and diminished contractility of the artery, by which the full impression of the systole, feeble though it may be, is conveyed to the finger. There may be failure of the extreme circulation, the temperature of the surface failing, the skin becoming covered with a clammy sweat, and the extremities becoming cold and shrunken. It has also been stated that feebleness in the ventricular systole, by which the first sound of the heart becomes less distinct than the second, is another sign of threatened death from asthenia. With the above symptoms there is also a dry, black, and chapped tongue, coated with black sordes, and similar incrustations upon the gums and teeth. The delirium characteristic of this condition is of the low muttering character, arising, as it were, from failure in the cerebral circulation, and consequently indicating a state of things different from that which gives rise to the active delirium of inflammation or excitement of the brain, and from the coma which belongs to nervous exhaustion. The eruption, when there is any, will often show signs of tendency to asthenia by assuming a livid colour; and another unfavourable symptom is the appearance of livid petechiæ or vibices, to which too there will often be added another unfavourable sign, namely, the passage of a large quantity of black blood by stool or urine. The patient at the same time sinks gradually towards the bottom of the bed, and the stools and urine pass involuntarily. The pulse is no longer perceptible at the wrist, and the heart's action becomes more and more feeble till it ceases altogether.

The Treatment of Continued Fever.—We believe that it will be found that the treatment of all forms of continued fever must be based upon the same principles, and therefore that there is more danger than advantage in dividing this disease into endless varieties, and apportioning to each its peculiar mode of treatment; since it will generally be found that the treatment most applicable to each will be best arrived at by the application of those general principles which have been established by an induction including all.

Absolutely ignorant as we are of the proximate cause of continued fever, we may nevertheless venture to affirm that there is no class of diseases in which science has done more towards their successful management; for by a systematized knowledge we become acquainted with the provisions of nature, by which the action of the morbific agent is rendered transient; and thence we are taught to look for its subsidence after a definite time; and consequently, to expect the recovery of the patient, provided that the functions necessary for the continuance of life can be maintained until that time, and also that no serious lesion is inflicted upon any vital organ. In the same manner, too, we become acquainted with the different modes in which fever may be fatal, and thus we are enabled in some degree to anticipate and guard against such terminations; or, in the words of Cullen, to "obviate the tendency to death," and also to subdue, where we cannot prevent, those local complications which may either be fatal by interfering with the functions of a vital organ, or, by prolonging the febrile state, interfere with and obstruct the natural tendency to recovery.

It may here be asked—Is it possible to cut short the fever in its onset? We know that various remedies have been recommended, and are still frequently employed, for this purpose, and that not without apparent success; but we know also that such measures are often applied, and that very early, without such a result; and further, that ephemeral fever is apt to occur under circumstances in which the continued might be apprehended, so that we see that the evidence in favour of the frequent success of remedies applied with this intention, rests upon rather slender grounds. At the same time we ought to state that the means that used generally to be employed, are a moderate bleeding followed by combination of a purgative with an emetic; as a dose of tartar emetic followed by rhubarb and calomel, or a cathartic draught: sometimes the tartar-emetic, by first exciting perspiration, and afterwards acting upon the bowels, will be of itself sufficient for the purpose. It should be remembered, however, that bleeding is rarely a safe proceeding at the commencement or at any other period of fever, and that the same remark may apply in some cases to the tartarized antimony, as well as to active purgatives. As a general rule, however, when there is no great tendency to diarrhœa, and the patient is seen early in the disease, the latter remedies may be used with advantage, in a moderate degree; since, although they will not often cut short the disease, yet such evacuations tend to give a favourable character to its subsequent progress, provided always that there be not already any signs of exhaustion—for instance, the administering an emetic of ipecacuanha with a small quantity of the tartarized antimony; and when the bowels are not freely acted upon, four grains of hydr. cum cret., and four hours afterwards two or three drachms of castor-oil.

Another means by which the fever may sometimes be arrested at its commencement is cold effusion; that is, pouring cold water freely over the whole surface, and then speedily drying the patient. After this has been done, it will not rarely happen that the surface becomes bedewed with a moderate perspiration, the patient falls into a sleep, and awakes with the skin cooler, and the fever much abated. This is a practice, however, which can only be pursued soon after the febrile reaction has set in, when the surface, including the extremities, is rather above than below the natural temperature, and the pulse moderately firm: for if it be applied after the fever has continued for some days, or when there is any tendency to coldness of the extremities, or the pulse is compressible (conditions which apply to the greater number of cases when first seen by the medical practitioner), we might incur the risk of dangerous or even fatal syncope, or, at all events, aggravate the tendency to internal congestions leading to some of those inflammatory complications which are amongst the chief dangers in fever.

Among the means of subduing febrile action which most readily suggest themselves is the abstraction of blood: but of this it cannot be said that it renders the subsequent progress of the fever more favourable; on the contrary, in the great majority of fevers in this country it enhances the risk of subsequent death from asthenia, which is, perhaps, the greatest to be apprehended from uncomplicated fever; and therefore, although it may be saying too much to affirm that in no case ought blood to be taken from the arm in a case of fever, simply as such; yet it is far more safe to regard such a practice as an exception from the general rule. When indeed the pulse is full and frequent, and not compressible, provided also this fulness is *real;* with a hot skin, a ferrety eye, or other signs of cerebral excitement, blood may be drawn, the patient being placed in an erect or sitting posture, and the vein closed upon the first signs of syncope. The quantity of blood which flows will be the sign of the propriety of the operation having been performed, and also of the tendency to any inflammatory complication. It is not here meant to deny that cases such as have just been described do occur ever in this climate, but that cases are not to be assumed as such simply because they are fever, and because the febrile excitement is considerable.

Blood-letting, too, when applicable in fever (simply as such), is so only at the commencement of the febrile reaction, and in the greater number of cases the practitioner is not called in till this has existed some days; and then, unless there be some very urgent symptoms indicating its performance, the question of general bleeding is not to be entertained: nor indeed is the abstraction of blood in any way, simply with a view to moderating the course of the fever: though local depletion, either by leeches or cupping, may be adopted with advantage, with a view either to obviate the tendency to one of the modes of fatal termination which there may be reason to apprehend, or to relieve any particular organ which may appear to be specially affected.

In the mean time those measures only must be adopted which will safely diminish the febrile action. Of these the first is what has been termed the antiphlogistic regimen, or placing the patient upon such a plan as regards both diet and external circumstances as shall the most effectually preclude all excitement of the nervous and vascular systems; though even at this period of the disease we must not lose sight of the principle, that we are endeavouring to avoid such excitement as much on account of the exhaustion by which it is generally followed, as from the immediate ill effects to be apprehended from the excitement itself.

The first thing then to be done is to prohibit all muscular exertion, and with this view the patient must be *strictly* confined to bed; all stimuli to the senses, and to the feelings and intellect must be removed. The room should therefore be darkened, or a very moderate degree of light admitted. Sound should be excluded where it can be done; all conversation and reading, and the access of more persons than absolutely necessary, forbidden. It is especially desirable that all persons about the patient, whether medical attendants, friends, or nurses, should maintain a cheerful though quiet deportment.

The diet at this time should be of the most unstimulating kind; milk and water, or thin barley-water, with an occasional cup of tea, will generally be sufficient, as long as the febrile excitement is great. The temperature of the room should be moderate—about sixty in summer, and from fifty to fifty-five in winter, and there should be as free a circulation of air as is consistent with the comfort of the patient. The advantage arising from this is, that the accumulation about the patient of noxious effluvia from his own person may be thus obviated, and the poison in the system more quickly eliminated. There is, however, some difference of opinion upon this point. Dr. Alison observes that the "disease frequently runs its course quite favourably in very foul and close air," and it certainly often appears when a patient has lain in a warm and close room during a considerable part of the disease that the change to cool and fresh air (particularly if accompanied with some muscular exertion) has an injurious effect, chiefly in bringing on a complication of inflammation. Now that many patients do well under the unfavourable circumstances of foul air and close apartments cannot be denied, but it will be found equally true that the rate of mortality is increased; and as regards the advantages of pure air, it has certainly appeared in many cases brought to Guy's Hospital from some of the worst houses in London, that the change to a purer air has of itself a beneficial effect upon the progress of the disease; and even in certain beds, which are the best placed for ventilation, the cases of fever are generally found to run their course most favourably. And certainly the cases do better when removed to one of the large general hospitals than when taken to the Fever Hospital; where, notwithstanding the most scientific application of every means of obviating it, there is a greater accumulation and concentration of the poison than in the general hospitals, where the patients are mixed almost indiscriminately, care only being taken not to allow a larger proportion than about ten per cent. of fevers in large and airy wards. All this, however, does not impugn the correctness of the remark of Dr. Alison just quoted, which shows the necessity for caution in effecting a removal.

Another important precaution, for such it is to be regarded, rather than a direct curative measure, is the regulation of the bowels. We know that in many cases the greatest danger to be apprehended arises from irritability of bowel, and therefore all stimulating and drastic purgatives must be avoided; but the accumulation of morbid and decomposing fæcal matter in the intestines being likely in itself to prove a source of irritation, it is necessary when there is not a moderate evacuation at least once in twenty-four hours, to relieve them by the hydr. cum cret., followed by castor-oil, as before recommended.

When the above precautions are observed, the greater number of cases, in persons of sound constitution, will generally recover spontaneously; the fever often beginning to subside in young subjects as soon as the eighth or tenth day; though in adults it will generally run on to the fourteenth or twenty-first. In these favourable cases active treatment cannot be too strongly deprecated, but there is one class of remedies which have long been in use in the treatment of fevers, though it is perhaps only of late years that their virtue has been fully appreciated; and these are, what have been termed salines; that is to say, solutions of the neutral salts or alkaline carbonates. They have generally been regarded as simple diaphoretics and diuretics, but they also tend to obviate that liability to capillary obstruction which is among the earliest effects of the morbific agent. It is possibly to their action upon the extreme circulation, that their effect upon the secretions is mainly to be attributed. The citrate of potass, which may be given either in the state of effervescence, or after it has subsided, and the liq. ammon. acet., are very useful and convenient salines; but they must be avoided when there is reason to apprehend bowel irritation; in such cases the bicarbonate of soda is to be preferred.

When, then, we are called to a case of fever, some days, as most commonly happens, after the reaction has been fully established; having satisfied ourselves that the disease is fever, and not one which may by possibility be mistaken for it, our first duty is to inquire into its probable origin, and having done this, to examine carefully as to the presence of maculæ, and all other symptoms which might give a distinctive character to the disease (particularly in reference to any prevailing epidemic). Our next object must be to ascertain, as nearly as possible, the age of the fever. We should then proceed to search, as far as the condition of the patient allows, for any of the lesions liable to complicate the fever, and if none of these be found, we should direct our attention particularly to the bowels, and to the brain. If there have been no evacuation within the last twenty-four hours, we should direct the hydr. cum cret. to be administered and followed by the castor-oil; if, however, there have been no alvine evacuation for a longer period, or if the medicine above recommended should fail in producing one, we should have recourse either to an enema, consisting of an ounce of castor-oil in a pint of gruel, or to a common soap injection. These means will rarely fail, though in some forms of fever, where there is considerable head affection, the bowels will be very obstinate, in which case a full dose of calomel may be given, followed by more castor-oil, and, if necessary, a cathartic enema may be afterwards administered. This practice, however, belongs more to fever complicated with *inflammation* within the cranium; and as a general rule drastic purgatives should be carefully avoided.

It may happen, on the other hand, that the bowels very early become irritable. When this is the case, and it appears that the quantity passed has been small, and if there are pieces of solid matter in the evacuations, we may at first give two grains (not more) of hydr. cum cret. and one or two drachms of castor-oil two or three hours afterwards, though it is not desirable that these medicines should produce more than two or three pretty free motions. After this, as also when we have good reason for believing that the bowels have been sufficiently emptied at the commencement, we must at once have recourse to means for checking the diarrhœa; the pulv. cretæ co. of the Pharmacopœia, in doses of about ten grains, will often answer this purpose; or it may be given with about a drachm of tincture of catechu in cinnamon-water: or the mist. cretæ in doses of about half an ounce may be employed, with or without about fifteen grains of the aromatic confection: though when there is much tenderness of the epigastrium, or the tongue is red, it is better to omit the latter. A very useful means of checking diarrhœa is an enema consisting of about three ounces of starch (decoct. amyli of the Pharmacopœia), and one ounce of syrup of poppies, or what answers nearly as well, about half a drachm of tincture of opium.

The head also demands careful attention, and, even although there may be no particular cerebral complication, we often have delirium about the middle period of the fever, or even earlier. Where this delirium is active, and the pulse at all sharp, and the pupils contracted, and if there be also considerable heat of the scalp, and throbbing of the carotids, a few leeches (*i. e.* from four to eight) may be applied to the temples; but we must be careful that the above conditions exist, as if this step be taken when the pulse is compressible, or the pupils at all dilated, as is the case in the delirium which attends the gastric irritation, we shall increase rather than diminish the danger of our patient. Where, too, there are the mulberry-coloured maculæ we must, as a general rule, abstain from the abstraction of blood. The shaving of the scalp will always be attended with relief, where there is any tendency to delirium with increased heat about the head.

When the excitement or delirium continues, we should apply a cold embrocation to the shaven scalp, provided the heat be considerable. A convenient application is one part of rectified spirit with five of water; or a better may be prepared by mixing one part of spirit with two of water, and two of vinegar: or two parts of liq. ammon. acetat. with one of dilute spirit. There is often much harm done from the slovenly way in which cold is applied to the head; if it be done by means of a piece of linen soaked in the lotion, this should be frequently repeated so long as the head remains hot, for if this be neglected there is a reaction as soon as the linen becomes dry, or nearly so, and thus the determination to the head is increased. On the other hand, it should be remembered that cold applied in this way is a sedative of considerable efficacy, and that if it be persisted in after the head and face have got at all below the natural temperature, there may be a risk incurred of injuriously depressing the moving powers of the circulation.

The state of the respiratory organs must at the same time be carefully watched; but here, except in cases of complication with actual inflammation of some of the thoracic viscera, there will rarely be occasion for active interference. In all cases of fever which are severe, there is more or less dyspnœa; and it will often be found, upon examination of the chest, that there are pretty extensive sibilus and ronchus, showing congestion and turgescence of the mucous membrane both of the small and large tubes: this, however, is not to be mistaken for active bronchitis, or to be treated as if it were such; the congestion being but the result of that general tendency to obstruction in the extreme circulation, which is one of the effects of the morbific agent. A small quantity of ipecacuanha in one of the saline mixtures already mentioned, may be given with advantage in such cases; provided the bowels are not very irritable: if they are so the ipecac. may be added to the soda draught, or given with a little cretaceous mixture. If the irritation of the bronchial membrane continues after the skin becomes soft or moist, a blister applied over the sternum will often afford much relief.

If none of the complications incident to fever make their appearance, we must carefully watch for symptoms indicating the approach of any of the fatal terminations. Now, the death by coma as well as the death by apnœa belong more to those cases in which there is inflammatory complication of the brain or lungs, and the appropriate treatment will be further considered in speaking of that belonging to such complications; it should, however, be borne in mind that either of these modes of dying may occur as a direct effect of the morbific agent. In the former case this may be by its effect upon the brain: under such circumstances, our remedies must be much less active than when the same termination is threatened from active inflammation of that organ; and it should be remembered, also, that mere stupor from which the patient can be roused, requires but little treatment; and the same thing is applicable to an obtuseness of the senses of hearing and sight, such torpidity of the brain being in general a favourable symptom: whereas, increased mental excitability or increased susceptibility of the above senses indicates an excitement which is liable to be followed by a corresponding exhaustion of the nervous power, ending in death by coma.

In the case of mere stupor but little treatment is required: the head should be kept cool, and when necessary the cold lotion applied; and if the bowels are sluggish, they should be stimulated by moderate purgatives, as the combination of rhubarb and calomel, or where they appear obstinate, five grains of the latter may be administered, and followed in three or four hours by half an ounce of castor-oil. When, as is sometimes the case, the inaction of the bowels is chiefly owing to the indolence or drowsiness of the patient, a common enema of gruel and salt, to which may be added an ounce of castor-oil, should be administered; or where they require more active stimulation, it may be composed of about twelve ounces of compound infusion of senna with a drachm of powdered jalap. In some cases of cerebral oppression with torpid bowels, a full dose of calomel, to the extent even of ten or fifteen grains, affords great relief; but it must be employed only where there is no tenderness of the abdomen or redness of the tongue, and where the motions which have been passed have been entirely solid and without mucus. In these, as in almost all cases of cerebral oppression, diuretics will be found useful, especially in the form of salines; indeed, the remedies just recommended need not interfere with the continuance of the saline treatment. Thus, the spirit of nitric æther may be added to either of the saline draughts; or it may be given with from five to ten grains of nitrate of potass.

In other cases, again, we have to dread death by coma, from exhaustion of the nervous power consequent upon continued excitement. In such it is that the mode of death is not altogether unlike simple asthenia or gradual syncope, taking place simultaneously with cerebral oppression; though the symptoms referrible to the brain are the most conspicuous and embarrassing, as well as those to which our treatment should be mainly directed. Here it is most important to allay the excitement, which may often depend upon the direct agency of the poison upon the brain, and appears to be the immediate effect of a state of that organ widely different from inflammation, but which may sometimes be associated with a tendency to that condition.

When the head is hot it should be shaved, and the cold lotion applied according to the cautions already given. The bowels must also be attended to, and sufficient evacuations procured, if necessary, by moderate purgatives; though sometimes the chalk mixture, or the starch and poppy clyster, may be required.

Here also, as in all cases of fever, the bladder must be carefully attended to.

The best remedy, perhaps, for the above condition of the nervous system (as long as the febrile excitement is considerable), is the henbane, which may be given where there is no tendency to diarrhœa, in combination with hydr. cum cret., or a little camphor may be added (F. 94).* When there is much tremor, and the excitement increases at night, we may withhold the henbane during the day, but, continuing the saline, try the effect of a full dose of the former at night, in combination with ammonia. If, as commonly happens, the restlessness continues, the question arises as to the procuring rest by means of a full dose of opium. This is one of the nicest points in the practice of physic, as the misapplication of this drug under such circumstances is an error almost fatal, sometimes altogether so. Opium must not be given when the heat of the scalp is considerable or the skin dry, or the urine scanty and loaded, or the pulse sharp, or the delirium violent, and above all, *when the pupils are contracted.* When, however, the heat of the surface has been subdued, and the skin softened or rendered moist by the saline and other treatment just recommended—when the secretion of urine has been increased, the pulse softened, the tongue moistened, and the delirium has become more of the talkative incoherent character, but without violence, and, which is *indispensable* in the administration of opium, if the pupils have become dilated, or even moderately full, we may, after several nights of restlessness, hope for refreshing sleep from a full dose of this drug or some one of its preparations. A convenient form will be from half a grain to a grain of hydrochlorate or acetate of morphia (perhaps the former is to be preferred); of this half a grain may be given at night, and should the restlessness continue without contraction of the pupil it may be repeated after two or three hours. When the first dose does not produce the desired effect, or where the skin and tongue are moist, the urine abundant, and there are other reasons either from the appearance and condition of the patient, or from previous history, to believe that he has considerable tolerance of opiates, we may increase the dose, giving as much as one grain of the hydrochlorate, or its equivalent, one drachm of the liquor. Blistering the nape of the neck may also be of service in such cases; but it must not be done till the febrile heat has subsided, and the activity of the symptoms have been in some measure subdued; neither must it be employed in cases where there are livid maculæ, with much depression and venous congestion, as there might be danger of sloughing. Upon the whole, it is a remedy more applicable to the case of stupor than of excitement. The use of wine is an important consideration in this condition in fever; the mere presence of delirium is not to be regarded as in any way contraindicating it, if the pulse is compressible and feeble, and the pupils not contracted; where, in fact, we have the symptoms of nervous excitement, with little power, and no signs of inflammation of the brain or its membranes, it may be as useful in preventing death by coma as that by asthenia.

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* (94) ℞ Hydr. cum Cret. gr. iss.
Camphoræ rasæ, gr. ij.
Ext. Hyoscy. gr. iij. Misce.
Fnt. Pil. ij.

It may, perhaps, be thought that the doctrine to which we have throughout given a somewhat prominent position, namely, —that the morbific agent in fever acts mainly upon the blood, and destroys its natural affinity for the tissues with which it is brought in contact in the course of the extreme circulation— is an opinion rather than an established law; but whether this be so or not, we believe, that it is a fact, that in fever there is this loss, or suspension of the natural affinities, which causes delay in the capillary circulation; and that, this fact is independent of any opinions that may be held, as to the blood being so affected; or as to its being secondarily influenced through the action of the poison upon the nervous system. This effect of the disease upon the extreme circulation often shows itself very formidably in the pulmonic circulation, threatening death from apnœa; the lividity and venous congestion, with diminution of the arterial pulse, in some cases of this kind are very remarkable, though death from this cause, independently of actual lesion of the lungs themselves, is not common; and in their treatment it will be important not to mistake the sibilant respiration intermixed with ronchus (which may generally be heard as the effect of the engorgement of the bronchial membrane) for acute bronchitis. In general, cases of this kind require little active treatment: a saline draught, consisting of the citrate of potass, or that with liquor ammon. acet. with the addition of about ten minims of ipecacuanha wine, or from fifteen to twenty of wine of potasso-tartrate of antimony, will commonly have considerable effect upon this state of the circulation; which effect will be aided by a moderate use of mercury, where it is not contraindicated by irritability of bowels; for this purpose from one to two grains of hydr. cum cret. may be given once or twice daily, with three of conium or hyoscyamus: when the skin has become somewhat moistened, a blister applied to the chest will promote the restoration of the pulmonic circulation.

Death from asthenia or from gradual syncope is perhaps the most frequent of the fatal terminations of fever, and in some epidemics it is one against which we must be prepared from the very commencement. On this account the pulse must be carefully watched, and as long as it remains sharp, and the skin hot and dry, and the urine scanty, the use of tonics and stimulants must be abstained from. But even in this condition of the patient beef tea may be allowed if it do not, as is sometimes the case, irritate the bowels. The best form where the stomach and bowels are irritable is Liebig's creatine soup. When the pulse becomes more compressible, especially if the tongue begins to soften at the edges, we may, if there be increasing signs of prostration, administer a little diffusible stimulant; that which may generally be employed with the greatest safety is the sesquicarbonate of ammonia, which may at first be combined with the solution of acetate of ammonia, as we thus gain the aid of a saline in promoting the passage of the blood through the capillaries: indeed it is often syncope or asthenia commencing in the extreme vessels (what we have ventured to term peripheral syncope) that we have to contend with; and consequently, although we may by stimulants maintain for a time the action of the heart, we can do but little towards overcoming the obstruction that embarrasses it, so long as the cause of that obstruction continues. On this account we must persevere with the salines whilst the pulse retains any sharpness, or the back stroke already noticed. A convenient form for the combination of these remedies is the following (F. 95).*

The next point to determine, and it is one of no small difficulty and of extreme practical importance, is the administration of wine. Now as wine is a direct stimulant to the heart and large vessels, and has but little influence over the extreme circulation except through the heart, it is certainly highly desirable to delay its use until the tendency to capillary obstruction has passed away; or, in other words, until the fever itself has subsided, which will generally be shown by the pulse becoming slower and fuller, but at the same time soft and very compressible. When this is the case, although the tongue may be brown, the patient almost unconscious, and in the most abject state of prostration, we may confidently expect the greatest benefit from wine freely administered. It is not always that the indications for its use are so clear, as in the worst cases we often find the central moving powers of the circulation to be failing, whilst the febrile state and the consequent difficulty of the extreme circulation continue: under these perplexing circumstances, we must be guided by other conditions as well as by the pulse. Thus, in cases where wine is most required, the patient generally lies prostrate upon his back and sinking lower and lower in his bed, the countenance is sunken, the eyes hollow, the surface is inclined to cold at the extremities, though it may be hot about the trunk. If, however, this heat is attended with dampness we may with more confidence administer wine. The state of the pupils will often aid us, for in general, stimulants are better borne with a full than a contracted one. The tongue in such cases will generally be brown from a crust of sordes, which also covers the teeth and gums. The state of pulse which affords the most certain indication for the use of wine has just been described; but since in the worst forms of fever we must not wait for that which may never show itself, we must consider feebleness and compressibility as themselves indications for the use of wine, provided the other signs of prostration are likewise present.

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* (95) ℞ Ammon. Sesquicarb. gr. iv.
Liq. Ammon. Acet. ʒ ii.
Tinct. Serpentariæ, ʒ j.
Infus. Serpentar. ℥ j. Misce.
Ft. Haust. ter sæpiusve die sumend.

A rule has been proposed by Dr. Stokes which is certainly worth attending to, though it may not be at all times applicable; namely, that when the first sound of the heart is nearly lost and becomes much more feeble than the second, wine is indicated. It will not be safe in all cases to wait for this symptom, but certainly where it does occur, it is in general a sign that stimulants are required. As regards the quantity of wine, it is impossible to lay down definite rules; it must be given according to its effects rather than by measure. Where the signs of sinking are not very urgent we may begin with an ounce of sound port or sherry, which may be diluted with an equal quantity of water, and given about four times in the twenty-four hours, or even a less quantity may be given at shorter intervals. It will always be necessary to watch most carefully the effect of the wine, and if it cause increased heat of the head or active delirium, or if the tongue become drier under its use, or the pulse more frequent and sharper, without any increase of volume, it must be withdrawn: but, if the tongue become moister or the pulse less frequent or fuller, and especially if the patient should get some sleep or appear more tranquil, even though the depression become more alarming, its use must be continued and the quantity increased, and this must be done without limit as long as the prostration continues, or the pulse appears to become more feeble. Sometimes ten, twelve, or more ounces must be given in the day, and brandy and also ether must be used in cases of extreme prostration; but such are almost desperate; though certainly where there has been a slow and compressible pulse, patients have sometimes been saved by the timely administration of the strongest stimulants.

Complicated Fever.—The treatment of fever complicated with inflammation of the brain or its membranes is a matter of great nicety, owing to the difficulty of ascertaining with certainty how much of the cerebral disturbance is owing to inflammation, and how much to the direct action of the morbific agent upon nervous substance. Where the symptoms plainly indicate that the former is the case, we must employ measures adapted to subdue that inflammation; though even here we must remember that depletion is not borne as in simple inflammation of these organs. In doubtful cases the head should be shaved and cold applied to the scalp, according to the directions already given. The next question will be the use of depletion: and here we must be guided by the sharpness and hardness of the pulse, by the state of the secretions (the bowels being almost always very difficult to act upon in cerebral inflammation, though rarely so in fever: urine also being scanty in the former case), by the tongue, which is more inclined to be white the more the disease, in the early stages, assumes the character of inflammation. We may also remark that when inflammation of the encephalon occurs in the course of mild continued fever, it has more of the character of common inflammation, and therefore is more amenable to antiphlogistic measures, and more tolerant of them, than when it occurs almost at the first commencement of severe fever. In the former case blood may be drawn from the arm *if the pulse will warrant it*, or the patient may be cupped behind the ears or at the back of the neck, and, if there be no great heat of skin, a blister may be applied. In the latter case it is rare that bleeding in any shape is admissible, especially if there be any eruption. The bowels must be freely opened by moderate doses of calomel, the action of which may be aided, if necessary, by a senna draught, and the calomel may be afterwards continued in doses of about two grains every four hours until some of its specific effects are produced: or if the bowels should be irritable mercurial inunction may be employed, or the blister may be dressed with mercurial ointment. In whatever form, and at whatever period of the fever, the signs of inflammation of the encephalon, provided they really are such, show themselves, opium is inadmissible; useful though it is in cases of nervous excitability without inflammation; the great guide, however, in this matter, is the pupil. A most important part of the treatment here, as in all cases, is obviating all excitement, and as much as possible all use, of the organ suffering from inflammation, or threatened with it: and therefore light must be excluded, and the room kept as quiet as possible, and every cause of mental excitement guarded against: forcible restraint must only be resorted to when necessary to prevent the patient inflicting an injury upon himself or others.

In fever complicated with chest affection the same principles of treatment must be pursued. When we have evidence that the disease really is fever, and where there is no reason for supposing the inflammation in the thorax to be a mere coincidence —as, for instance, the effect of exposure to any exciting cause of such inflammation after or shortly before the invasion of the fever—we are justified in believing that the local disease is the effect of the morbific agent upon that particular organ, and may consider it, much in the light of a specific inflammation, amenable to laws somewhat different from those by which common inflammation is regulated, and less tolerant of antiphlogistic treatment. In this case, too, we may reasonably expect that if the local disease do not entirely subside, it will be very much mitigated when the general fever comes to an end. If, on the other hand, we have reason for believing that the local disease is the effect of some cause independent of the fever, we cannot entertain the same expectation of its spontaneous subsidence, and are therefore called upon to use more active measures for its suppression, and calculate upon a greater amount of tolerance of them. But it may be urged that the physical signs in both cases are the same, and in both we have the general symptoms of fever. The way to escape from this difficulty is to remember that it is the whole condition of the patient that we have to deal with, and not *only* the bronchitis, or pneumonia, or other local inflammation; and therefore we must be guided as to the use of antiphlogistic and other measures by the probability of their tolerance as evinced by the greater or less degree of prostration, by the tongue, and, above all, by the pulse; and where these, especially the latter, do not indicate a toleration of depletion, we are not justified in having recourse to it on account of the inflammation, whatever reason we may have for supposing, that it arises from ordinary rather than specific causes. In all doubtful cases, moreover, there is far less risk in refraining from depletion than having recourse to it upon uncertain grounds.

Of the bronchial congestion, threatening death by apnœa, and of the inexpediency of treating it as acute bronchitis, we have already spoken. Where, indeed, there are rattles as well as the wheezing, and the skin is hot and the pulse sharp, if the tongue be furred as well as red at the edges, the saline, with the addition of antimonial or ipecacuanha wine may be administered (the latter is to be preferred if the bowels are irritable), and the mercurial with henbane may be given as before recommended. When the dyspnœa is urgent, with pain referred to the sternum, *and the pulse is such as to justify it*, blood may be taken by the application of a few leeches over the sternum, or, what is better, by cupping. Cases may indeed arise that require general bleeding, but they are exceedingly uncommon. When, as it is apt to do (more especially if depletion have been unadvisedly used), the bronchitis assumes the asthenic and suffocative form already described (p. 213), it must be treated accordingly, and with even a greater amount of stimulants and support, than simple bronchitis.

In many cases of fever we have pneumonia occurring as a complication; and often in a form likely to escape detection, unless the chest be carefully examined. Now the importance of the discovery consists more in its forewarning us of the mode of death (that by apnœa) which is most to be apprehended, than in suggesting any active measures for the subduing of the inflammation.—We are not, of course, here speaking of the diagnosis between primary pneumonia and typhus fever, which has been already explained.—When the primary disease is fever, and the pneumonia occurs in its progress, it is probably owing to the effect of the morbific agent upon the lung itself; and when consolidation is the result, the deposit producing it may be of a nature analogous to that spoken of as the typhous deposit, occurring in the intestinal glands, and therefore not of a character to be improved by depletion: but, whether this be so or not, we must be guided in the use of remedies by the condition of the patient, and *not be led to employ venesection because there is pneumonia*, unless there is evidence, from the pulse and other symptoms, of its probable tolerance. If the pulse be such as to justify the depletion, which it rarely is, we may hope, by the use of bleeding or cupping, either to put an end to the inflammation, or so far to arrest its progress as to allow time for employment of the means already recommended for the treatment of that disease; but whilst this is admitted, the caution is again repeated, that the great danger lies in being hurried to the use of venesection through anxiety to save the patient from so formidable a complication of the fever: and a belief is expressed, which increased experience tends to confirm—that the inflammatory complications of specific diseases will, more often than is commonly supposed, subside with the primary disease, and—that local disorganizations have been in some cases caused by the lowering means employed. When bleeding from the arm is inadmissible, local depletion by cupping or leeches may sometimes be required; but even of these we would say that they are not to be used merely because there is local evidence of the pneumonia; we must also have some increase in the *hardness* as well as sharpness of the pulse.

As regards the other means to be employed, amongst which mercury is the chief, the same caution must be observed: that is, we must bear in mind that the inflammation is essentially liable to become disorganizing, and therefore, if the engorgement have led to consolidation, we must, when the patient is in a condition to allow of auscultation, examine from day to day; and if we find in the situation where the signs of the consolidation were observed, crepitation, whether moist or dry, the mercury should be withdrawn, or the quantity greatly reduced. The mercury may be combined with opium when the latter is not contraindicated by any tendency to head affection, and where there is not great debility, the tartarized antimony may be exhibited at the same time; though where there is bowel irritation the compound ipecacuanha should be preferred.

The existence of pneumonia as a complication in fever, ought never to deter us from the use of support and stimulants when we have evidence of failure of the powers of life, as evinced by the same symptoms as in simple fever—accompanied often by the plum-juice expectoration—and then the same means already recommended must be employed, with the addition sometimes of about fifteen minims of tincture of squills to the mixture of serpentary and ammonia.

The treatment of fever with bowel irritation is often most embarrassing; though the difficulty may perhaps be often avoided, where the case comes sufficiently early under our notice, by the rigorous exclusion of all the influences, whether in the form of medicine, or diet, or external circumstances, which tend to favour this complication. On this account, all irritating purgatives should be avoided, amongst which must, as regards this disease, be included the saline ones, from their effect upon the secretion from the small intestines; and, at the commencement of every fever, where a laxative is indicated, and there is reason to apprehend a possibility even of this complication, the safest that can be used is the hydr. cum cret., followed by the castor-oil, or where we are afraid of the latter offending the stomach, the hydr. cum cret. with rhubarb. The same precaution is necessary in regard to diet—it should from the first be of the most unirritating character; barley water, milk and water, or even milk with bread, should constitute the whole, excepting perhaps a little tea. Milk, when not disagreeable to the patient, is perhaps the best article of diet in fever, until stimulants become necessary, and is to be preferred to the beef tea so much used in our hospitals, as being less likely to cause diarrhœa, or to aggravate it. There can be little doubt that the tendency to diarrhœa is much increased by impure air, especially that loaded with effluvia from organic matter, and therefore ventilation and cleanliness are here of special importance. In cases of fever with bowel complication, we may allow of a lower temperature than in some other forms; as, for instance, chest affections.

One great rule is to avoid officious practice: the best medicine will generally be found to be the bicarbonate of soda in peppermint water, with a little mucilage; when the bowels are much relaxed, a clyster should be administered of about two ounces of starch, with from half a drachm to forty minims of laudanum, or an ounce of syrup of poppies. When the diarrhœa is excessive, chalk-mixture with some additional astringent, as a little tincture of catechu, or about fifteen grains of extract of logwood; though it is better, if possible, to prevent the diarrhœa by careful diet than to restrain it with astringents. When the powers of life appear to be failing, the serpentary should be used with about fifteen grains of aromatic confection, and, if necessary, from three to five of sesqui-carbonate of ammonia; wine and brandy are not so early admissible in this as in the other complications; but the former may be administered in arrow-root when the pulse becomes feeble and the tongue brown. When there is much irritability of stomach, which is not an uncommon occurrence, besides the application of sinapisms, the occasional use of a tea-spoonful of brandy in a wine-glass of soda-water will often give great relief.

XXXI.

ERUPTIVE FEVERS.

The general laws of idiopathic fever are, those of the exanthems. Of these, indeed, typhus might be reckoned as one, excepting that they are generally more definite in their symptoms, course, and character, under every variety of climate, season, age, and habit of body: they are, in fact, the results of specific agents upon the system, producing respectively their specific effects, in every instance,—similar in kind, though varying in intensity. They are characterized each by its peculiar rash, efflorescence, or eruption, whence the terms exanthem (from εζανθεω, *effloresco*), and eruptive fevers. They have also each its period of incubation or interval between exposure to the poison and invasion of the febrile symptoms; the period of eruptive fever; the period of maturation of the eruption; and in most, the secondary fever. The fevers to which this description applies are, small-pox, measles, scarlatina, the mild disease varicella or cow-pox; probably also, the plague, and in most respects erysipelas.

They have also the peculiarity that one attack protects the individual from a second of the same form of epidemic; this law does not, however, apply to plague, and is reversed in the case of erysipelas. Individual exceptions also occur in all.

In the cases of small-pox, measles, scarlatina, and plague, we have pretty certain evidence not only that these diseases are contracted by intercourse with those labouring under them; or in other words that they are contagious; but that they never arise from any other cause than this specific contagion, either introduced into the system in the form of a virus, or possibly exhaled by the breath of the affected, and also existing in the emanations from the surface of their bodies; as is shown by their communicability by inoculation, and by their conveyance in clothes from affected persons; and also as we now witness them by their never being produced in any other way. This is not true in the case of erysipelas,—though it is undoubtedly contagious—and has been questioned in regard to scarlatina; though the occurrence of what are termed sporadic cases, of the latter, or single cases, in which no such communication can be traced, may possibly be accounted for by the extreme subtlety of the poison.

Notwithstanding that the cause of the majority of these diseases is contagion, this contagion is controlled by a variety of circumstances, affecting not only individuals but the whole population of any town or district, as is shown by their spreading at times with great rapidity, and at times assuming a peculiar virulence. These epidemic influences are, no doubt, dependent in a great measure upon obscure atmospheric or telluric conditions; but they are also greatly aggravated by circumstances arising out of the habits and conditions of various populations; such are the—deficiency of ozone or allotropic oxygen, existing in very densely-populated districts,—the effluvia arising from defective drainage and the filth in the dwellings of the masses, —the allowing noxious particles to accumulate, from the want of personal cleanliness, and the like.

The pathology of these eruptive fevers may be summed up as the combination of an inflammation of the surface, of a specific character, with a constitutional fever, of a typhous type; but this local inflammation is not the cause of the fever, since in all cases it follows instead of preceding it. The internal inflammations also which occur are of a specific character in each respectively, and, therefore, to be regarded as the effects of the poison. The danger in these fevers, with the exception of small-pox, depends not so much upon the extent of the external inflammation,—since it is an important part of the pathology of some of them, that there is danger in arresting the course of it—as upon the internal complications, and also upon the affection of the general system, especially the depressing influence of the morbific agent upon the circulation.

Small-pox is characterized by a tolerably uniform period of incubation, varying from seven to twelve days, and an eruptive fever of about forty-seven hours, a period of from seven to eight days from the appearance of the eruption to its completion, and, in severe cases, secondary fever of three or four days more.

The fever of small-pox commences, like most others, with chilliness and languor, quickly followed by heat with a dry skin, severe headache, and, in the majority of cases, an intense dull, aching pain in the loins, sometimes nausea and vomiting, a hard, frequent pulse, a whitish, furred, and rather dry tongue. These symptoms are not all present in every case, at the commencement even of a severe attack. Much stress is laid by some authors upon the pains in the loins, and it is, perhaps, one of the most frequent concomitants of the eruptive fever: and its occurrence, when small-pox is at all prevalent, should, to say the least, excite our suspicions. Sickness is another frequent symptom at this period, but not so common as the last mentioned, and, to say the least, it is not so constant in this as in the inflammatory fever of scarlatina. Some severe cases commence with convulsions, and others, which are still worse, with violent delirium or coma.

After the fever has lasted, as before stated, about forty-eight hours, though the period admits of variation of from thirty-six to sixty, the eruption begins to make its appearance. To this it is most important to pay close attention, as up to this period our diagnosis between small-pox and some other exanthems can only be conjectural. It first appears at least thirty-six hours from the commencement of the fever (which is later than in scarlatina, but earlier than in measles), first of all in the face, in which respect also it differs from scarlatina, and consists, in the first instance, of minute elevated papulæ, which feel under the finger like small beads, or millet-seeds. These are often surrounded by an erythematous efflorescence, which, however, generally disappears after two or three days. After the face the eruption generally appears in the wrists, the trunk, and, last of all, in the lower extremities; and, in general, the last papulæ do not show themselves till two days after the first; that is to say, the eruption begins upon the third day of the fever, but fresh papulæ do not cease to come out till the fifth. The papulæ or pimples gradually enlarge, and ripen into pustules, showing a depression on their tops on the second day. This appearance is important, as affording a distinction from the vesicles of varicella, in which the depression is not observed till later; the suppuration is complete on the eighth day of their appearance, when the pustules breaking, scabs or crusts begin to form, which fall off in four or five days more, the suppuration and incrustation observing the same order as to time in different parts of the body, as did the eruption of the pimples. This description of the progress of the pustules applies pretty exactly to all varieties of the disease. There is, however, a great difference in their number, and, in the same proportion, in the severity of the disease, the number of the pustules being, as a general rule, an exact measure of the extent to which the morbific poison has taken effect; and to which that highly sensitive and important structure, the skin, has been involved in the inflammation. In some cases there are but a few scattered over the body; in others, they are crowded together in great numbers; and that may be the case to such a degree, that there is not, as it were, room for them to remain separate, but they coalesce and run into one another. This circumstance affords a means of distinction into two important varieties.

As long as the pustules are distinct, and retain individually their circular form (though they may be very numerous), the disease is called *variola discreta*, but when they coalesce and unite into irregular clusters, or patches of suppuration, it is termed *variola confluens.*

In the variola discreta, or distinct small-pox, the eruption follows pretty accurately the course which has been indicated, the pustules becoming turgid and globular from being filled with pus, but retaining their central depression, from the pus being deposited not so much immediately under the cuticle, as in the areolar tissue, by which the summit of the pustule is, as it were, bound down to the cutis. . As the pustules fill with pus, the parts most affected by them, as the face and wrists, become swollen, so much so that the eyes are sometimes completely closed; at the same time, there is often a feeling of tightness about the fauces, as if from swelling, and the salivary secretion is much increased. About the eighth day a dark crust forms on the pustule, the cuticle cracks, and allows the escape of the pus, and the pustule gradually shrivels and dries, forming a scab, which, in a few days more, falls off, leaving a red skin, which does not disappear for several weeks, or a permanent depressed scar which remains for life. In this variety of small-pox the fever may be very severe at the commencement, but it subsides as soon as the eruption is complete, and recurs, after the maturation of the pustules, for three or four days in the severer cases, constituting the fever of maturation. It is by the appearance of the pustules in the face that we judge of the variety to which it belongs, according as they are distinct or confluent in that situation. Sometimes, when the pustules are numerous, they touch without inosculating or uniting, when the pock is said to be cohering, constituting what is in truth a severe form of the distinct.

The confluent form manifests throughout a greater intensity and virulence in the morbid poison. The eruptive fever is more violent, and the cerebral oppression and disturbance far greater; the fever, nevertheless, being of a more decidedly typhous character, the pulse being more feeble at the same time that it is more frequent, and the tongue more disposed to be brown: the eruptive fever is shorter, the pimples making their appearance earlier about the face, but not coming out with the same regularity as in the distinct form, accompanied by a rash not unlike that of scarlatina, so much so as with the shortened eruptive fever to give rise to some difficulty in the diagnosis. Sometimes, too, the eruption is not unlike that of measles, but as regards the diagnosis from the latter disease, the shortening of the eruptive fever will prove an assistance. The pimples are also less regular in their development than in the distinct form: for, though the papulæ soon lose all resemblance to that of either scarlatina or measles, by filling with fluid at their summits, they have more the character of vesicles, containing a whitish fluid which afterwards degenerates into a brownish colour, and do not plump up into true pustules: there is often all this time a livid appearance in the surface, between clusters of the confluent pustules; the swelling of the limbs and salivation are also greater than in the other variety; sometimes there are spots of purpura. In some cases, and those most dangerous, the eruption makes its appearance in the form of small livid circular spots, without any elevation, and which by mere inspection and manipulation it is impossible to distinguish from purpura, though the character of the eruptive fever may often guide us to a diagnosis. There is in this form of small-pox a remission rather than intermission upon the coming out of the eruption, and this remission is often but slight, and on the fifth or sixth day rigors occur, marking the fever of maturation; but about the eighth day of the rash, and the eleventh of the fever, being the time at which the maturation is complete, there sets in the secondary fever, the intensity of which is characteristic of the confluent disease. This is the most perilous period of the disorder; indeed, a large proportion of the fatal cases die from the tenth to the fourteenth day of the fever, rendering the second the most perilous week. Some, indeed, die of this disease in the first week, the nervous system being overwhelmed by the disease, and the patient dying of syncope. In the second week, most deaths occur, the patients dying from apnœa, through affection of the air-passages; though subsequent deaths take place, either from asthenia, owing to a want of power to recover from the depressive influence of the disease, or from the effects of some complication.

The internal inflammations which accompany small-pox are mostly those of mucous membranes, the conjunctivæ of the eyes and the lining of the fauces being commonly inflamed early in the disease, that of the trachea and bronchiæ generally at a later period; a low form of pneumonia may also occur towards the termination.

After the fever, especially in the severer cases, inflammations are apt to occur, which run quickly into suppurations, affecting especially the subcutaneous areolar tissue, and the eye, sometimes the joints, the pleuræ, or the lungs: empyema also is a common sequel.

The prognosis of small-pox is mainly dependent upon the variety. Distinct small-pox is rarely fatal; in the coherent or semi-confluent form, the mortality is about one in ten; in the confluent one in two. The favourable circumstances are early and distinct eruptions, previously good constitution, previous vaccination, the appearance of menstruation at the commencement in females, the swelling of the joints at the period of maturation. The unfavourable symptoms are, the fever assuming the form of typhus, the pustules becoming flattened or ichorous, the interstices livid, and sprinkled with petechiæ, the non-appearance of the swelling at the period of maturation or its sudden subsidence, sudden prostration, pallor, great anxiety and oppression at the præcordia, coma, early delirium, syncope, severe affection of the larynx and trachea, subsequent suppurations, and inflammation of the lungs or pleuræ. The danger of small-pox is very great in infancy, less in childhood and early youth, and in adults it increases with the age.

In the milder cases but little treatment is required besides a cool apartment, good ventilation, light diet, attention to the bowels, moderate antiphlogistic treatment, as James's powder, and salines, and watching for internal complications.

In the severe cases the principle of our treatment must be the same, with some modifications, as those of the management of continued fever. We must endeavour to control the febrile excitement; but we must bear in mind that there is a long and depressing process of disease to be gone through, and therefore we must husband the powers of the constitution.

The heat of skin, headache, and throbbing pulse, in the commencement of the inflammatory fever, might seem to indicate bleeding; but experience has shown us that the amount of the eruption, which is the true measure of the violence of the disease, is not affected by it, and there is danger of giving a character of typhus to the fever. Gentler measures must, therefore, be had recourse to. In the first place, then, and before we can be certain of the precise character of the incipient fever, we must treat the patient much as in the commencement of common continued fever. If the bowels have not been freely acted upon, we must insure their being well cleared out with an efficient but not irritating purgative, as the hydrarg. cum cret., followed by castor-oil, or the combination of rhubarb and calomel, and a saline draught should be administered every four or six hours; and when the skin is hot, a pill, as annexed (F. 96),* may be given at bed-time, and the same mode of treatment may be continued until the eruption is complete; but when the pulse is compressible, and the fever exhibits any tendency to typhus, we must give support freely, in the form of beef-tea, broth, and farinaceous substances. When there is delay in the appearance of the eruption, or it is of the vesicular character, gentle stimulants may be employed, and the liq. ammon. acet. with excess of ammonia may be administered: and as in cases of this kind there is only slight remission of the fever during the progress of the eruption, and the patient will often be very restless at night, we must endeavour to procure sleep by opiates, and these are more especially required about the fifth day of the eruption, unless they are contra-indicated by tendency to coma. The best form of opiate will be about half a grain of muriate of morphia in solution, or from twenty to thirty minims of laudanum. Whilst giving the opiate, we must always be careful to insure at least one moderate evacuation for the bowels daily. It is about this period that the powers of life may be expected to fail, and if the pulse become more compressible we must administer wine, nad as a more efficient stimulant, it will be well to substitute the combination of serpenteria and ammonia for that above mentioned. In what has just been said we have pointed out the measures required in the more dangerous form of the disease, as it is in that only that any active interference is required, excepting during the eruptive fever, when the treatment will be the same in either case. In the distinct small-pox, after the eruption is completed, and in the severer cases even before, there is often considerable thirst with difficulty of deglutition, acid drinks are grateful, and as good a form as any is the infus. ros. co. When the maturation is completed, there is often much irritation from the abraded surfaces; to allay this, equal parts of powdered starch and powdered calamine well rubbed together should be sprinkled upon them.

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* (96) ℞ Pulv. Jacobi veri, gr. iv.
Hydr. Chlorid. gr. iss.
Ext. Hyoscy. gr. iv.
Fnt. Pil. ii. hora somni sumend.

It must be admitted that, as in continued fever so also in small-pox, although judicious treatment may obviate many perils that may arise from external or accidental causes, or may keep out of the way things absolutely hurtful, still it can do little or nothing towards controlling the disease itself; and therefore the only means of arresting the mortality which would otherwise ensue from this fearful malady is prevention.

The plan first adopted for this purpose was giving the disease to a healthy person by means of inoculation, and it was found that thus given it was much milder than when received by ordinary contagion, or, as it is termed, "in the natural way:" thus inducing an immunity, at a diminished risk, from future attacks. This plan, which was first introduced into this country by the celebrated Lady Mary Wortley Montagu, was for many years the only method of prevention used. Subsequently it was discovered by the illustrious Jenner that a disease apparently similar, the variola vaccinia, may be communicated to man from the cow, and that although an incomparably milder one than variola received from the human subject, it has nevertheless nearly, if not absolutely, equal power of protecting the subject from any future attack of variola. It may also be transferred from one human subject to another by inoculation, and retain the same protective power.

Such are the two measures which have been adopted to guard against one of the most fearful scourges that have visited humanity. Of the former, it may be said that it was merely the submitting to a great evil to escape a greater: that though the inoculated disease was much milder than that from ordinary contagion, it was nevertheless not very unfrequently severe, and in some few instances fatal; and that it is open to the still stronger one that it keeps a pestilence alive in a community, since a person suffering from the inoculated small-pox can communicate the disease in its severe form to any unprotected subject. Upon these grounds the practice of inoculation for small-pox is forbidden by law in almost every country in Europe; whereas, in most, the vaccine inoculation is more or less compulsory. in this country it is now rendered practically so. The small-pox from inoculation has therefore become a mere matter of history, whilst an acquaintance with the appearance and subsequent effects of the disease produced by vaccination has become still more necessary.

When vaccination has been successfully performed, no results apparent to the naked eye show themselves till the third day, though by the aid of the microscope an efflorescence may be perceived round the puncture on the second. On the third day, however, the wound is red and elevated, and on the fifth, the cuticle is raised into a white vesicle, containing a minute quantity of a thin transparent fluid; the normal form of the vesicle is probably circular; but it may be of that shape or oval, according to the mode of making the incision. The vesicle may be said to be perfectly matured on the eighth day; its margin is turgid, and sensibly elevated above the surrounding skin;* its colour may be yellowish or pearly; at this time it may measure from a quarter to half an inch in diameter. Like the pustule of small-pox it has the central depression, and like it, it is cellular; the lymph being contained in ten or twelve cells. About the time of the perfecting of the pustule, the redness which may hitherto have extended very little beyond its base, begins to spread and form what is termed the areola, which is a red border round the pustule, extending more and more till the eleventh day, when it begins to fade: in doing which it becomes livid, then gradually paler, leaving behind it a degree of hardness of the surface. About this time a brownish crust forms over the vesicle, which becomes harder and darker, and if not previously abraded, falls off about the twentieth day. Though the disease is so slight, and attended with but little constitutional disturbance, there is a certain amount of febrile disturbance about the eighth and ninth days, analogous to the secondary fever of small-pox, marking the affinity of the two diseases.

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* Gregory's 'Lectures on Eruptive Fevers.'

For some years after the introduction of vaccination into this country there was, as might be expected, a great doubt, and more than doubt, in the minds of many, of its efficacy, whereas numbers received the evidence of its protective influence in the majority of cases, as proof of its affording a complete and permanent security in all. The truth, however, lies between the two extremes of opinion: vaccination does not afford perfect and permanent security through life to all upon whom it may be said to have been successfully performed, perhaps not to more than two-thirds; but there are few, if any, of those so operated upon who do not enjoy a great immunity from the risks of small-pox, amounting almost to a certainty of never being affected by that disease in its dangerous form. In many persons the protective influence shows itself not by preventing an attack of small-pox, but by so modifying it that the disease is, as it were, cut short, and subsides before reaching the dangerous stages; to which it may be added, that the immunity, as regards a dangerous attack of small-pox, is, to say the least, as great as that conferred by a previous attack of small-pox itself. Certain it is, that fatal small-pox in the successfully vaccinated is almost unheard of, and it is equally certain that cases are upon record of persons dying from a second attack of small-pox.

As, however, the legislature has practically decided the question between inoculation and vaccination, there remains a very important one, and that is, the duration, as well as the degree of security conferred by vaccination. There certainly occurred for several years after Jenner's discovery nothing to shake the confidence in the practice of vaccination; but, in course of time, cases of small-pox of a modified form presented themselves in persons concerning whom there was satisfactory evidence of their having been duly vaccinated; and these cases became more frequent as there were more and more persons living who had been vaccinated ten, twenty, or more years previously. The history of these cases certainly favoured the belief that the protective power of vaccination diminished in the course of time, as numbers who were exposed to contagion in childhood with impunity, suffered from modified small-pox in after years. The author of the present work was himself exposed purposely to the contagion of small-pox, when an epidemic prevailed, and that by being on several occasions brought in contact with children suffering severely from it, and with perfect impunity (he being then about seven years old, and having been vaccinated in infancy), but when at the age of twenty-two, suffered from a severe attack of modified small-pox: and many cases have occurred under his notice of this form of small-pox in persons past the age of puberty, who had been vaccinated in infancy, though cases are not wanting of modified small-pox in childhood and early youth. The inference from all this is, that the protective power of vaccination, in any individual, is impaired by time, and that it is probably still further affected by the change which takes place in the system at the time of puberty. It is, therefore, to say the least, expedient to renew it, and perform re-vaccination about the age of sixteen or eighteen.

The modified small-pox differs from the true in the character of the eruption, but still more in the duration and intensity of the fever: Dr. Watson mentions three distinct forms:—

(1.) "The eruption sometimes approaches, in its character and course, very nearly to that of the ordinary small-pox; the pustules fill up, have the central depression, and ultimately crust over, and the face swells. But this course is performed in a shorter time than that of the ordinary disease; and the pustules are usually smaller. This is the severest and least common form of the modified small-pox."

(2.) "Sometimes the papulæ show a little fluid on their tops only, but never fairly suppurate or break, but the vesicles dry up, and hard prominences, with livid bases and horny summits, remain."

(3.) "There are other cases in which a great part of the eruption consists of red pimples, which soon become livid, but contain, from first to last, no fluid whatever."

In most cases all three varieties coexist; the pustules first appearing, those, namely, on the face and chest, coming to maturity, whilst those which last appear, on the legs and feet, for instance, drying up, or merely presenting the red pimples.

The difference, however, in the fever is still greater, and more important; the constitutional disturbance at the commencement, that is to say, the eruptive fever, may be at the first as severe as in the ordinary small-pox; but just as the pustules are beginning to mature, the fever subsides, and the patient becomes convalescent, the disease appearing to be mysteriously arrested just at the time when in the unprotected it would become most severe and dangerous. To this we may add, that most threatening cases sometimes do occur in those who have been vaccinated, in which even the fever of maturation sets in: but, nevertheless, when we are beginning to fear that the protective power of vaccination may have been exhausted, the disease suddenly subsides; and this we must never despair of its doing at any time.

The modified small-pox in general requires little or no treatment besides antiphlogistic regimen, cool air, and, if necessary, gentle laxatives. In those cases in which it assumes the character of the severe form of the unmodified disease we must treat it upon the principles already laid down for the unvaccinated, though we may give the friends, and, when he can appreciate it, the patient himself, the encouragement of the hope that the course of the disease may be at any period suddenly arrested, a hope in which we shall rarely be disappointed.

The *varicella*, or chicken-pox, is in itself a disease of little importance, though it deserves notice from its resemblance to the milder forms of small-pox. It affects infants and young children almost exclusively. There is scarce any premonitory fever, so that the disease is first announced by the eruption. which makes its appearance on the scalp, neck, breast, and shoulders, with but very few vesicles on the face; in which respect it differs most from small-pox. The eruption consists of perfectly transparent vesicles, of which fresh crops continue to appear for two or three days in succession, the old ones beginning to shrivel about the third day, after which they become pearly and opaline, and leave small dry scabs, which crumble away, but sometimes leave shallow cicatrices. These, however, are probably the result of suppuration of vesicles which have been inflamed by rubbing.

The important diagnosis of this disease is from small-pox, from which it may be distinguished by the absence, or very short duration, of the eruptive fever, and by the truly vesicular character of the eruption, the vesicles being perfectly simple, consisting, in fact, of cuticle detached and raised by the fluid; the effect of which is, that the walls of the vesicles, not being kept down by any intervening areolar tissue, there is, during the first two days, no central depression; it is therefore very important to watch the first appearance of new vesicles, as it is only by inspecting them within the first two days that we can be perfectly confident that the disease is not small-pox, as, after they have begun to shrink, and after some have been irritated to suppuration by rubbing, it is next to impossible to say that the case is not one of either very mild, or modified, small-pox.

This varicella has the characters of a distinct exanthem; it occurs only once in the same person, spreads by contagion; *it is not,* however, *communicable by inoculation,* in which respect it presents a marked contrast to small-pox, which, even in the modified and mildest form, can be reproduced in this way. Another important distinction is, that vaccination is no preventive to chicken-pox, and that the previous occurrence of chicken-pox does not in any way interfere with the regular progress of the vaccine vesicle. It is needless to enter further into the question of the identity of small-pox and chicken-pox, since it has long been decided in the negative, though there may now and then be great difficulty in the diagnosis between the two: and there is a necessity that when we meet with an equivocal eruption we should enjoin the same precautionary measures as if the case were one of undoubted modified *small-pox.*

The *measles*, or *rubeola*, called oftener by the older nosologists *morbilli*, is another exanthem, having a distinctive eruption, an eruptive and secondary fever, very rarely attacking the same person more than once.

The period of incubation after exposure is about fourteen days; sometimes there is no apparent deviation from health during this time, at others, as Dr. Gregory points out, the patient is languid, and has ill-developed febrile symptoms for a greater or less portion of the time; so that there is apparently a greater want of uniformity in the premonitory fever of measles than of the other exanthems. In the morbilli regulares of Sydenham, the fever sets in in the ordinary way, with rigors, pain in the back and limbs, headache, &c., &c.; but what may be regarded as in a great measure characteristic, is that coincident with this there are catarrhal symptoms, coryza, epiphora, sneezing, rawness of the thorax and chest, and pain across the forehead; the pulse is quicker, and the tongue white; the eruption makes its appearance upon the fourth day. Dr. Gregory assigns seventy-two hours as the standard time; so that we may lay it down as a rule that this eruption is later in making its appearance than either of the cognate diseases, small-pox and scarlatina. The eruption begins on the face and neck, travels down to the lower extremities, like the small-pox, the latest appearing about three days after the first. The papulæ begin to fade three or four days after their appearance, so that the whole course of the eruption occupies six or seven. The eruption consists of small, scarcely-elevated papulæ, not presenting the millet-seed sensation of small-pox to the fingers, but still perceptibly raised, especially on the face, which is slightly swollen: they coalesce into clusters, which often assume a crescentic, or horse-shoe form. The papulæ eventually die away in crust, which crumbles off in a fine powder. Quite unlike the scabs of small-pox or the desquamation of scarlatina.

The fever, as already described, is of an inflammatory character, more decidedly so than in the other exanthems, and the catarrhal inflammation which accompanies it is sometimes severe; when the eruption makes its appearance, there is not uncommonly diarrhœa, showing the disposition of the disease to attack the mucous membranes: at this time, too, the fever and catarrhal inflammation both become more severe, and continue until the eruption has covered the whole body, in which respect this disease presents a contrast to small-pox. Another remarkable point of difference is that in measles the danger is almost in an inverse proportion to the eruption, its chief source being apparently the inflammation of the mucous membrane, to which the eruption appears to act as a revulsive. In the generality of cases, the fever and inflammation both begin to decline when the rash begins to fade upon the face—that is to say, on the fourth day of the eruption; about this time, also, there is sometimes diarrhœa, which seems to afford considerable relief.

In the severer cases, however, the symptoms, both general and local, become increased in intensity at the subsidence of the eruption; the bronchitis extends into the smaller tubes; and to it, is often added pneumonia, which may prove fatal either by apnœa or exhaustion: in some cases, too, the fever assumes a typhoid form: sometimes there is exhausting dysenteric diarrhœa. It is not very uncommon for the eruption to recede suddenly (in some instances, as we have reason to believe, from imprudent exposure, but in others spontaneously), when some of the unfavourable symptoms above described will manifest themselves.

The diagnosis of the disease is not difficult, depending upon the character and duration of the eruptive fever, and the appearance and progress of the eruption. The eruption may be said to be the true characteristic, and without it we can never pronounce a case to be measles, though sometimes there is to all appearance the true rubeolous rash, preceded by slight fever, but without any catarrhal symptoms appearing, often when measles is prevailing epidemically, but sometimes when it is not —a disease which has been described under the term *rubeola sine catarrho*. It may well be doubted whether it is measles at all, since not only does it confer no immunity against the true disease, by which it is often quickly followed, but it sometimes appears to attack those who have already had measles in preference to those who have not.

The prognosis and treatment of measles are, as it were, corollaries to its history and progress. The most favourable signs are an abundant rash, persistent for the full period, fever of sthenic but not violent character, absence of pneumonia or capillary bronchitis, and the decline of the symptoms with the fading of the rash, with free spontaneous action of the bowels at this time. The untoward events or signs are scanty eruption, and still more its sudden arrest or retrocession; fever manifesting a tendency to typhus, capillary bronchitis, pneumonia, aggravation of the symptoms at the subsidence of the eruption, constituting a species of secondary fever. Independently, however, of its immediate fatal results, measles often induces serious secondary consequences, or excites latent tendencies to constitutional diseases. The most frequent instance of this is the calling into activity any tendency to tuberculosis, when in children of this diathesis there ensue strumous enlargement of the glands, scrofulous affections of the eyes, joints, or other parts, tuberculous disease of the lungs or of the encephalon.

In the milder forms of measles but little treatment is required: the patient should be kept moderately warm in bed, and a saline mixture administered of either acetate of ammonia or citrate of potass, with a few minims of antimonial wine, and tincture of hyoscyamus or conium; if the eruption should recede, the patient must be placed in a warm mustard bath. The great danger arises from the bronchitis or pneumonia. We must carefully watch for the symptoms of these complications, and treat them according to their extent and intensity much as when they occur idiopathically. When these are detected early, moderate depletion may be had recourse to, and will be well borne, and moderate doses of calomel with Dover's powder, or antimony with opium, may be employed. Blisters may also be used when the more active symptoms have been subdued, unless, as is often the case in scrofulous children, there is a liability to troublesome sores, when they had better be avoided; in such subjects, if blisters have become necessary, it is best to apply one, only for one or two hours, according to the age, and then remove it, and if at the end of an hour there is no vesication to repeat it; or after the blister has been applied for two or three hours, to remove it altogether, and apply a linseed poultice in its place. If typhoid symptoms should show themselves, the case must be treated as one of low fever, with the cautious use of ammonia and other stimulants. As the diarrhœa which comes on upon the subsidence of the eruption is often sanatory, we must endeavour to imitate it, should it not occur spontaneously, by gentle purgatives.

Great care is required, in the after-management of measles, to prevent cold, by the use of warm clothing, and avoiding too early exposure out of doors.

Another eruptive fever, of frequent occurrence, and in too many cases of a fatal tendency, is *scarlatina*, or scarlet fever. The former term is a corrupt word, which custom has sanctioned amongst nosologists and professional men, and which it would be well if we could replace by the English noun, scarlet-fever; but there is a difficulty in all reforms of this kind, and in this particular instance we are often induced to use the word "scarlatina" in accordance with the prejudices of the vulgar, who, from its termination resembling that of a diminutive, are much less alarmed by the word than if we were to speak of scarlet fever. Hence, therefore, we adopt the mongrel word as a sort of euphemism for the English.

By whatever name, however, it may be called, it is a most destructive disease, and one the mortality from which appears to have been of late years increasing. Like the other exanthems, it has its period of incubation, its period of eruption, and its secondary fever. Besides this, the scarlatinal poison, like others of a kindred nature, has a tendency to concentrate itself upon particular parts, inducing complications, which in many cases are to all appearance the natural consequence of the disease, and yet are not integrant portions of it, since it may run its course without their happening. Scarlatina has most of the characteristics of a true exanthem; it is highly contagious, though, no doubt, the susceptibility of a whole population may be greatly influenced by atmospheric and other causes, and therefore it sometimes spreads with great rapidity, or, in other words, prevails epidemically: it rarely attacks a person a second time. It is particularly fatal to the young. The susceptibility to the poison appears to be greatest from infancy to puberty, after which it appears gradually to diminish as the subject grows older, ceasing almost entirely about forty; though some few instances do occur after that age. Women, however, in the puerperal state are very susceptible; at least, if they are not attacked oftener than others of the same age, they are in greater danger from the disease when it does occur.

Scarlatina then has a period of incubation of from ten to fourteen days, and during that time the patient commonly appears in his usual health. It makes its first invasion with ordinary signs of pyrexia, severe headache, and very commonly sickness, and on the second day an efflorescence is observed on the neck and breast. This extends upwards generally towards the face, and downwards over the trunk and lower extremities: in the former situations the rash makes its appearance in large bright, red blotches, of indeterminate form; often nearly the whole surface is of this colour throughout: on the extremities it puts on more of a spotted appearance, which it is possible to mistake for measles, though there are no true papulæ, the cuticle not being elevated as in the last-mentioned disease. During this period the pulse is sharp and frequent, the skin hot, the tongue coated, generally red at the edges, with very elongated papillæ. In uncomplicated scarlatina, the rash keeps well out for from three to four days; it then begins to decline, and fades away altogether about the seventh; soon after this, desquamation of the cuticle commences in the form of scurf, from the face, neck, and trunk; but in large scales or rather sheets from the extremities; sometimes the whole cuticle of the hand has come away like a glove. The fever has now, to all appearance, run its course, but it is evident that even now the poison has not been entirely eliminated; or, as others would rather have it, the series of morbid phenomena is not complete; since even after this mild form of the disease, we not uncommonly find subsequent lesions of other organs, apparently the effect of the morbid poison locating itself in them. Such is the simple, uncomplicated scarlet fever, the *scarlatina simplex* of nosologists.

This exanthem, however, more commonly presents itself in a severer form, in which the morbid poison attacks the fauces and tonsil glands. In this, the *scarlatina anginosa*, the fever sets in much in the same manner as in the preceding, but is accompanied or shortly followed by a sense of stiffness about the muscles of the neck and throat; the characteristic tongue, with red edges and elongated papillæ, shows itself almost from the commencement, and upon looking at the fauces, we may perceive the tonsils and uvula to be swollen. This swelling, and with it the general fever, continues to increase, and swallowing and deglutition become painful, and often the respiration is difficult, and the patient lies with the head rather thrown back. At the earlier period, the pulse is quick and sharp, but in most cases readily compressible. The tonsils continue to enlarge, and there is often much stiffness of the jaws; so that it becomes very difficult to inspect the fauces, which are commonly covered with aphthous crusts. These crusts are often mistaken for ulceration, which, though not very common, it does sometimes occur. The enlarged tonsils may be felt externally, and the glands about the throat swell likewise. The pressure thus produced upon the large vessels no doubt promotes congestion in the brain; but, independently of this, there is sometimes early delirium, and as the disease advances, there may be tendency to coma. The inflammation about the throat extends often to the mucous membrane of the nostrils, and a sanious ichor flows from them; the lining membrane of the Eustachian tube becomes likewise affected, and the inflammation spreads along it to the internal and external ear, and there is often an irritating discharge from the latter; the eye may also become affected in like manner, and sometimes the areolar tissue of the orbit. The mucous membrane of the larynx may also become the subject of inflammation, producing sometimes death from suffocation, by the obstruction caused by the consequent swelling. The serous membranes, too, of the head and chest may likewise become implicated, and of these the tissues most likely to be affected are the arachnoid and the pericardium. Scarlatinal pericarditis is perhaps a more common affection than most practitioners are aware of.

It is about the fourth day of the fever, when the rash begins to decline, that these complications are most likely to ensue, and therefore this may be regarded as a period of great danger, though in those cases in which there are no complications beyond that of the throat, there is great danger about the eighth day, when the febrile symptoms assume more the character of typhus, and the patient sometimes sinks under the depression produced by fever, aggravated, it may be, by the protracted suffering: but he will generally do well, as regards the immediate danger, if he survive the eighth or ninth day.

The last form of this disease which we have to notice, is the *scarlatina maligna*, than which a more fatal one is not to be found in the whole range of nosology, or one which more speedily and entirely crushes the powers of life. In the scarlatina simplex, the amount or intensity of the poison appears to be small, and it is not even concentrated in any single part; in the scarlatina anginosa there is danger owing to the poison locating itself and setting up a specific inflammation in an important and susceptible part; but in this the intensity or virulence of the poison is such that all the forces of the system—the nervous power, and the action of the heart, as well as the vital affinities of the extreme circulation—appear to be destroyed, or at least suspended, although in this form, as in the last, the poison exhibits a tendency to localize itself in the fauces.

The initiatory fever of this malignant scarlatina differs from that of the other forms only in its greater intensity, and in its greater proneness to assume the character of typhus. There is great oppression in the countenance, the eyes are suffused, the oppression about the præcordia and the general prostration are greater, and the pains in the back and stiffness in the muscles of the neck are more severe; the pulse is small and feeble, and the fauces, when inspected, present a dusky-livid appearance. The eruption is generally late in making its appearance, and when it does, it is livid and often interspersed with spots of purpura. The poison, as before observed, early attacks the throat, which, upon inspection, is seen to be dusky, swollen, and livid. There is an offensive fœtor in the breath, which, when once observed, is again readily recognized; ashy sloughs form upon the tonsils, which ulcerate and sometimes become gangrenous. The voice is hoarse and the respiration performed with a difficulty almost like that of croup. The throat becomes clogged with a glairy phlegm, which the patient in vain endeavours to expel, and the sanious ichor before mentioned streams from the nostrils, causing excoriation of the upper lip, and ulceration of the angles of the mouth.

Delirium, sometimes of a low muttering kind, sets in early; in other cases there is a tendency to coma, and in others violent maniacal excitement seizes the patient suddenly. As has been before pointed out, the poison seems to destroy the natural vital affinities of the circulating fluid; and as a consequence, general capillary congestion, shows itself in the air-passages by wheezing and urgent dyspnœa, and, in the alimentary canal, by irritable bowels and bloody stools. Sometimes the effects of this congestion are manifested by early collapse, the surface becoming cold, dusky, and shrunken, especially in the extremities, and the pulse at the wrist nearly imperceptible. Should the patient linger to the eighth or ninth day, there will generally be then an aggravation of the fever, and the patient will die, either from sinking, or from apnœa owing to congestion of the lungs, or from coma produced either simply by the effects of the poison upon the brain, or by the congestion produced by the pressure of the swollen glands upon the large veins in the neck, which also tends greatly to aggravate the dyspnœa.

It has been already stated that in this, the malignant form of scarlatina, the rash is generally late in making its appearance, but in some cases it never appears at all. Thus cases now and then appear of putrid sloughing of the throat, without any rash whatever, tending rapidly to death by sinking, and of which it is at first very difficult to discover the origin. Subsequent cases of scarlatina, obviously traceable to communication with the patient so affected, leave no doubt as to the real nature of the disease. But this is not all; sometimes young persons who have been in undoubted intercourse with others labouring under this disease, have died almost suddenly: in some instances, no cause for death could be found, upon careful examination. Now, when we consider the rarity of sudden death in childhood (we do not mean infancy) and youth, and when we take into account also the acknowledged virulence of the poison of scarlatina, it is not too much to believe that it may have produced death by its direct influence upon the nervous or circulatory system. In other cases, again, death has taken place very speedily in young persons exposed to scarlatinous poison, and, upon examination, the cause has been found to be internal inflammation, often of a puriform character. In one instance, a child, previously healthy, became collapsed, without much pain in the abdomen, but apparent distress about the epigastrium, had some sickness, and died in a few hours. In this case, there was found peritonitis somewhat of a puriform character, involving the peritoneal surface of the duodenum and of a portion of the stomach and neighbouring viscera.

Though scarlatina, in its severe forms, is so frequently fatal during the fever, the danger does not stop there, and therefore the sequels of the disease deserve attention. The most familiar of these is the process of desquamation. This is itself a reparative process, being the mere falling off of the dead cuticle, to make room for the new; but till this process is completed, the susceptibility of the constitution is great, and the functions of so extensive and important an organ as the skin, being liable to disturbance from changes of temperature, there is, as might be anticipated, a corresponding danger of disease of the complementary organs—the kidneys,—hence, for want of caution at this time we may have the scarlatinal dropsy, of which, for convenience' sake, we have spoken in connection with diseases of the kidneys.

Dr. Gregory remarks, with truth, that when there has been serious anginose affection, the cellular membrane of the neck will often take on inflammation; erysipelatous redness of the neck, with great hardness and swelling are perceived; the cellular membrane sloughs; this sloughing, if extensive, brings life into hazard. This observation is important, both for a caution in practice to be presently noticed, but also as an instance of the close affinity between scarlatina and erysipelas. This tendency, to excite inflammation of the areolar tissue, does not, however, confine itself to that particular part, as it may also show itself in the same tissue elsewhere; as, for instance, in the orbit. The ear, as we have remarked, often becomes inflamed during the fever, and the inflammation may assume a more chronic character, and continue after the subsidence of the former, becoming sometimes of a puriform nature, with a highly-offensive odour, and leading to the destruction of the bones of the ear. The ulceration sometimes extends also to the petrous portion of the temporal bone, producing in some instances inflammation of the membranes, and in others abscess in the substance of the brain.

It is remarked by Dr. Gregory, that scarlatina differs from measles, in that the former is accompanied and followed by phrenitis and dropsy, and measles by pneumonia. The same proposition might, perhaps, be enunciated in more general terms, by saying that scarlatina has a greater tendency to attack the serous membranes; possibly this may be dependent on the connection between scarlatina and Bright's kidney, in which there is so remarkable a liability to serous inflammation; it is evinced by another sequel of scarlatina not very generally noticed, arthritic inflammation resembling rheumatism. In whichever way we account for it, we certainly meet with inflammation of the serous membranes, sometimes without any albumen in the urine, sometimes with arthritic inflammation, and sometimes without it; the proneness of the different serous membranes following much the same order as in rheumatism;

the pericardium becoming most frequently involved next the pleuræ, and membranes of the brain, and, lastly, the peritoneum.

Of the prognosis of scarlatina we need add little after what has been already stated; the diagnosis must also in the same way be tolerably apparent. We may, however, remark, that not only in the subsequent inflammation, but also in the appearance of the eruption, scarlatina will sometimes closely simulate erysipelas. The close affinity of these two diseases has not perhaps generally received the attention which it merits.

Like all virulent and dangerous diseases, scarlatina has had its share of "certain cures," but when these are tested by the truly malignant forms, they prove as certain failures.

The scarlatina simplex is, as we have stated, a very mild disease, going on spontaneously to a favourable termination, and needing little treatment; in such cases, then, the "*nimia medici diligentia*" of Sydenham should be sedulously avoided. Even here, however, care should be taken to prevent over-exertion and exposure to cold, till the desquamation has been completed; since such cases do not appear to be more exempt from the invasion of scarlatinal dropsy than are the more severe. Dr. Gregory appositely remarks, that we may as summarily dispose of the treatment of the typhoid form of the disease, or *scarlatina maligna:* this in spite of all vaunted specifics, should be treated according to the dictates of common sense; that is to say, by support and stimulants, from the first evidence of the true character of the attack. Good beef tea should be early administered as freely as the patient can take it; and when the powers of life begin to fail, as shown by the dry brown tongue, black sordes about the mouth, dusky extremities, and feeble pulse, wine should be given, not according to measure of ounces, but its effects upon the circulation. Of medicines, strictly so called, ammonia is the best of stimulants. Some practitioners have imagined that it has an almost specific influence upon the disease; but whether that be so or not, its use in the malignant cases should never be omitted, provided the patient can swallow it. The best form for its exhibition is the mixture of serpentary and ammonia (p. 687). When the pulse becomes, as it sometimes does, nearly imperceptible at the wrist, ether may be added. It may be well, too, at the commencement of such cases, when the skin is hot over the whole surface, to add the liquor ammon. acet., in doses of one or two drachms, according to the age. As the ammonia is sometimes irritating to the fauces, so much so that it cannot be taken, we must in that case have recourse to other stimulants; the tincture of bark may then be used, and with it ether, in infusion or decoction of bark, and in such cases small doses of the chlorate of potass may be added. Some practitioners place great reliance upon this salt, and certainly it is not undeserving of trial when the ammonia is found inadmissible; when that is not the case it should not supersede its use, though a solution of one drachm of the chlorate in a pint of water may be used for a drink, which will be neither unpleasant to the patient, nor inconsistent with the exhibition of the ammonia.

The great difficulty, however, is in the management of the intermediate cases, because here the result is more influenced by the treatment. In the invasion of the disease, the skin being hot, and the arterial excitement great, the obvious indication seems to be to employ decided antiphlogistic measures; but here, as in all specific fevers, we must remember that the poison is of a depressing character, and that the disease has a determinate course to run; for the latter reason, and still more from the test of experience, we may say that the abstraction of blood is, as a general rule, inexpedient; there may be cases in robust subjects, with a full, strong pulse, where it may be borne; such, however, are exceptional. Another means which has been recommended to fulfil the above indication, is the administration of an emetic at the onset, and this should be done then, if at all; but the success of the practice is doubtful. Vomiting often comes on spontaneously, and this sickness is certainly a general symptom in some very mild epidemics; still Dr. Gregory regards it as in itself unfavourable.—We should have some hesitation in adopting the practice. There is, however, another safer means of lowering the vascular excitement, and that is by a moderate but efficient purgative. We do not by this mean that purgatives are to be employed blindly, but that when we are sure that there is no tendency to diarrhœa, and have reason to believe that the bowels have not been freely acted upon within the preceding twenty-four hours, a moderate dose of rhubarb and calomel, or of scammony and calomel, will be a safe remedy.

The practice of cold affusion, as introduced by the late Dr. Currie, of Liverpool, is another of the means proposed for keeping down the fever, and cooling the surface; but though in those cases to which it is applicable, it is a grateful and efficient remedy, the number of such is very limited, and, unfortunately, does not include the most dangerous: "it is adapted," says Dr. Gregory, "for young persons with high anginose inflammation and a burning hot skin," but unfortunately, it is not applicable, on the one side, to cases of plethora, or on the other to those of debility. The tepid sponging recommended as a substitute, is a useful auxiliary at a later period.

The practice most applicable to those cases which require decided remedies, and can be benefited by them, will be, as

Dr. Watson well observes, that which is proper for many cases of continued fever; it is one to which the author has been led, or rather which he has been compelled to fall back upon, after no inconsiderable experience of this distressing malady, and glad is he to find himself in accordance with that judicious and accomplished physician.

The first thing to be done is to insure the free evacuation of the bowels, either in the manner above recommended, or by a moderate cathartic draught; put the patient in the best-ventilated apartment at command, and remove all bed-hangings; without good ventilation you can do nothing; keep the surface as cool as possible, by not allowing the patient to be overwhelmed with bedclothes. In the sinking cases, it is true the extremities are apt to become cold, and this must be guarded against; but, as a general rule, let the coverings be light. Keep the head cool, and remove all superfluous hair; if there be delirium threatening, or head affection, it must be shaved. The patient may then be put upon the use of the liquor ammon. acet.; and if the skin be very hot, it may be sponged with tepid vinegar and water. The acid gargles, as that of infusion of roses with sulphuric acid, are agreeable in mild cases, and cleanse the throat; but when there is any ulceration or excoriation, they cause pain; the gargle of mel rosæ and bark will then be preferable; lime water with honey is also a useful cleansing gargle, or a mixture of chlorate of soda and water in the proportion of a drachm to a pint. But a most valuable means of checking the inflammation, is the application of the nitrate of silver, in a strong solution, to the uvula and tonsils, and around the fauces as far as it can be effected, and this may be repeated after twelve hours if possible.

We must now watch carefully for the invasion of cerebral symptoms in the way of active delirium, and when these occur in moderately strong subjects with a firm pulse, a little blood may be abstracted by leeches; some writers recommend their being applied to the throat rather than the temples, but against this practice in general, objections have already been stated: the best situation is, however, over the mastoid processes, where they are not likely to produce the same inconvenience, and where, should the bleeding be too profuse, which it is apt to be in scarlatina, especially with children, pressure can be conveniently applied. Our attention must still be directed to the throat, and as the disease advances, if the swelling continues, hot well-made linseed poultices should be applied externally. The bowels should throughout be carefully watched, as much with the view of preventing costiveness as of checking diarrhœa; for the former purpose a moderate dose of castor-oil is the safest; for the latter a starch enema, with syrup of poppies, or the chalk mixture with aromatic confection, may be given. The powers of life should now be carefully sustained; milk, or milk and water, and beef tea should be given as nourishment; and when the pulse begins to grow feeble, or even decidedly compressible, gentle stimulants must be employed. Of these the best is the sesquicarbonate of ammonia, which may be added in excess to the acetate. If the prostration still increase, the tongue become brown, and sordes begin to accumulate about the teeth, the serpentary, with bark and ammonia, may be used (F. 96).* About the same time, too, we may commence the cautious administration of wine, carefully watching its effects, and regulating its quantity accordingly.

The author has in several instances treated severe scarlatina anginosa from the first with pretty full doses of the tinctura ferri sesquichloridi.

Of the management of scarlatinal dropsy we have spoken elsewhere; we need therefore merely urge the necessity of, in all cases, using every precaution to prevent any chill to the surface, until the desquamation is entirely completed, which will not be till the end of three weeks, or sometimes more, and during this period the urine should be from time to time tested for albumen. It is in the fourth week that we most frequently meet with the dropsy, which is in many cases preceded by headache, dyspnœa, or pains in the loins; in some very severe cases it is ushered in by convulsions; in others, however, it creeps on quite insidiously.

The rheumatic sequels of scarlatina do not appear to have received the attention from authors which they deserve. Most practitioners must be familiar with the fact of arthritic swelling of a very troublesome character occurring at the close of scarlatina, though many have doubted the identity of these with rheumatism; but not only have these arthritic swellings a close resemblance to that disease, but there is the same tendency to metastasis of the inflammation to the heart and pleuræ.

The treatment of these affections requires considerable caution, since after so depressing a disease as scarlatina the patient has rarely strength to endure the measures ordinarily adopted for the cure of acute rheumatism. When it is confined to the extremities, the treatment of the arthritic affection with the acetate and nitrate of potass, or in feeble subjects, the carbonate will best fulfil the indications; and when cardiac inflammation supervenes, the same practice may be continued, with the addition of moderate doses of calomel and opium; as, for instance, a grain of calomel with half a grain of opium may be administered every six hours; and if there be no great heat of skin, a blister may be applied to the region of the heart.

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* For instance—

(97) ℞ Ammon. Sesquicarb. gr. xviij.
Tinct. Cinchonæ co. ʒ iv.
Tinct. Serpentariæ, ʒ iij.
Syrupi Aurantii, ʒ iij.
Infus. Serpentariæ, q. s. ft. mist. ℥ iv.
Sumat part 6^{tam} quartis horis—for a child of ten years.

Another disease of which it is most expedient to treat in connection with the exanthems, is *erysipelas*, a disease about which there exists much difference of opinion upon almost every point, not only as regards the meaning and derivation of the term, but also the nosology, the pathology, its origin, and treatment. As regards its place in a system of nosology, that is now a matter of but little importance; but we deem it expedient to treat of it in connection with the exanthemata, though reasons might be urged for placing it amongst the phlegmasiæ: the truth is, that it holds a middle place between the two, partaking, as we shall see, of the characters of both.

Erysipelas has, according to some, a period of incubation of about a week, though this does not seem to hold true of all cases. It sometimes begins without any previous signs of fever: this applies only to the mildest cases; in the more decided there is an eruptive fever, commencing with rigors, languor, pains in the limbs, followed by increased heat of skin, frequently sickness and vomiting, headache, thirst, restlessness, &c., a white tongue, sharp pulse: with the fever there is often an inflammatory state of the fauces, of greater or less intensity. After a period varying from twenty-four to sixty hours, but generally about thirty, a redness appears most commonly upon the face, sometimes, though not so often, upon the legs, and still more rarely upon the trunk. The redness is soon followed by heat and tension of the part, and this redness, pain, heat, and swelling evince a disposition to spread to the surrounding parts (whence the name of the disease). When the eruption attacks the face, it is almost always the side of the nose, close to the inner angle of the eye, which is first affected. The swelling soon involves the whole of the eyelids, which assume a characteristic œdematous appearance, and the eye is often closed; it then generally spreads over the whole face, and on to the scalp, sometimes extending down the throat or the back of the neck; in some instances it descends even to the extremities, and does not subside until it has invaded every part of the surface.

The eruption of erysipelas appears to consist in an inflammation of the cutis, apparently differing but little from that set up by cantharides or scalding water: the inflammation producing, as in the latter instances, an effusion of straw-coloured fluid (though, in some cases of a low type, this fluid may be a sanious ichor), which separates the cuticle from the *cutis vera*, forming blebs or blisters of different sizes. These generally break and discharge their contents, and the raised cuticle dies off in scales, leaving a red or livid surface, according to the less or greater typhoid tendency in the patient; the whole process of desquamation being generally completed in a fortnight. The inflammation, however, in the severer cases is not confined to the skin, but extends to the subjacent areolar tissue, constituting one of the severest forms of what used to be called "cellular membranous inflammation." In this inflammation there is, as might be anticipated, little or no plastic power, the effusion being at best but of the character of molecular lymph, and in a large number of cases puriform; and there being little or no power to circumscribe the effused pus with plastic lymph, extensive and destructive gangrene supervenes.

Whilst all this mischief is going on upon the surface and in the areolar tissue, the constitution sympathises, as might be anticipated. In the milder cases the fever gradually subsides without its assuming a low type, or any dangerous complications arising, and the patient is convalescent in a few days. In the more severe, the tongue becomes brown, the pulse compressible, the eruption livid, and the patient is reduced to the condition of the lowest typhus. The swelling of the face in such cases is often so great as entirely to obliterate the natural features, and give the patient a most frightful appearance. In this form of the disease the patient may die of exhaustion within a week, often about the fourth or fifth day.

Besides the direct effect of this fever upon the system, there is another cause of depression in the puriform infection, or pyæmia, from the diffuse suppurative inflammation, not to mention the probable depressing effect upon the nervous system of extensive inflammation of a part to which is distributed so abundant a supply of sentient extremities of nerves, as is the case with the skin: but, besides these, there are apt to arise dangerous complications, the organ most likely to be so affected being the brain. Delirium, sometimes of a fierce character, at others having more that of delirium tremens, may suddenly set in, and the patient die comatose about the eighth or ninth day. Some pathologists regard this as the effect of metastasis to the brain, and though Dr. Gregory considered this proposition as untenable, there are facts in its favour, such, for instance, as the delirium supervening upon the inflammation about the head being checked by cold applications, and its subsiding upon the use of external irritation. In these cases the brain presents no morbid appearance after death beyond mere engorgement of the vessels. The stomach is sometimes attacked, the symptoms being uncontrollable sickness, with a tendency to rapid exhaustion. There is in children a great liability to muco-enteritis when suffering from this disease. Erysipelas also attacks the serous membranes much in the same way that scarlatina does; and another point in which it resembles that disease is its tendency to seize upon the throat. This it does in a still more dangerous manner, the inflammation extending often to the epiglottis and larynx, and causing death from apnœa.

The tendency of erysipelas to excite puerperal peritonitis has been already noticed, and it is remarkable that handling the affected peritoneum in dissecting a subject that has died of the latter disease, is very likely, if there be any excoriation, to set up erysipelas of a formidable character.

The cause of erysipelas is to this day rather an agitated question, though perhaps few will now be found hardy enough to deny that it may be propagated by contagion; or, on the other hand, to assert that communication with an infected person is its alone cause. It is also miasmatic; that is to say, either excited, or its diffusion promoted, by some atmospheric or other epidemic influence, as in several seasons it spreads with unusual rapidity; though, whether this may arise from any specific poison pervading the atmosphere, or merely from the season being such as to induce a weakness of body in which there is less power of resisting the poison when applied to it, may admit of dispute. The spread of erysipelas is greatly facilitated by neglect of cleanliness, defective ventilation, and overcrowding of sick persons in the same apartment, as in the wards of an hospital; want of attention to these particulars favouring the development of what has been termed hospital miasma, which is characterized by the extension of erysipelas and its kindred disease hospital gangrene. Erysipelas often attacks wounds and sores, and is therefore peculiarly to be dreaded after accidents and operations. With regard to a poison so subtle and so easily conveyed as is that of erysipelas, it is difficult to give a positive answer to the following queries:—Whether it ever appears in its worst form in the wards of hospitals, &c., without being imported, and whether it spreads in such situations independently of any prevailing atmospheric or other epidemic influence? In regard to the first of these queries, it is highly probable that it may so arise, and that it would more frequently do so but for the great precautions that are now used. On the other hand, however, the majority of cases that do occur at Guy's, particularly, may be traced to importation from without, and its extension in the medical wards especially has been pretty effectually checked by the exclusion of such cases, and the speedy removal of any that may occur.

We have already spoken of breach of surface (and of this class of causes there is none which is so likely to excite erysipelas as leech-bites) as inducing susceptibility, if not sometimes acting as the direct and immediate cause of erysipelas itself;—exposure to cold is another. There is also a certain constitutional and, apparently, congenital susceptibility inherited by some persons, so that the slightest exposure to cold, the merest scratch, or the application of a single leech will induce erysipelas. This is often so slight an affection that it may well be doubted whether it is essentially the same disease, more particularly as it rarely or never propagates itself by contagion; this opinion, however, does not seem to be warranted upon other grounds; and, therefore, the inference to be drawn from such cases is, that in some persons it is very easy to generate erysipelas *de novo*, and that it is not capable of communication without a certain amount of concentration or intensity of the poison.

The treatment of erysipelas is simple: it presents the same questions for decision, and should be guided by the same principles, as that of continued fever. The milder cases require but little treatment, attention to the bowels, saline draughts, with the addition of a little antimonial wine will generally be all that is required in the way of medicine: the patient should also be kept in bed till the inflammation has subsided, and precautions should be used against exposure to cold until the desquamation is complete.

In the severer cases the same treatment should be used at the commencement: the patient should be put to bed, a gentle aperient, in the shape either of rhubarb and calomel or hydrarg. cum cret. and castor-oil administered, and salines used. The best form will generally be the liq. ammon. acet., to which may be added sp. æth. nit., and when there is any sharpness of the pulse, a few minims of antimonial wine. A question now arises as to any applications to the surface, and various modes of treatment have been recommended: in mild cases the best application will be the sprinkling of flour or starch over it; the latter is preferable; finely-powdered charcoal is, but for its blackness, an appropriate application. Painting the affected part with the simple tincture of iodine, of the strength of about three grains to a drachm, has been much recommended, and in many, when thus applied to the affected part, it appeared to arrest the extension of the inflammation; in many cases, however, the disease proceeded as if quite uninfluenced by it. When the tension is great, especially about the face and scalp, the making a large number of minute punctures with the point of a lancet, and subsequently fomenting the parts so as to encourage the bleeding, is a very useful means of lowering the local inflammation, and often with it the constitutional fever. The long incisions which have found favour with some practitioners cannot, however, be too emphatically condemned: *cold applications should never be used to erysipelas of the face or scalp,* but warm fomentations are often soothing when there is much tumefaction of the eyelids.

As the disease proceeds, the question of the use of stimulants becomes the all-important one. In erysipelas we must generally endeavour to anticipate the prostration, and as soon as the pulse becomes compressible, the sesqui-carbonate of ammonia should be added in excess to the amount of about five grains: indeed in this disease, like scarlatina, the volatile alkali seems to have a peculiarly favourable effect. As the tongue becomes dry and sordes begin to accumulate upon the teeth, wine must be freely administered, as in the low forms of other fevers, and the serpentary or bark should be used for the vehicle of the ammonia; a good form is the annexed (F. 98).* The bowels should be watched; they must not be allowed to become loaded; and if diarrhœa supervene, which it sometimes does, the enema of poppy and starch should be administered.

In severe cases, where there is no head-affection, the sesqui-chloride of iron, in doses of about fifteen minims of the tincture every three or four hours, appears to be almost a specific, not that it equals the serpentary and ammonia in the highly-dangerous typhoid form of erysipelas.

Another important question will be the use of opium. Where there is restlessness at the commencement of the disease, henbane may be used freely, and will often be effective, but in the more advanced periods, if there be much delirium, it will rarely have any effect: we must then have recourse to opium, provided the secretions are tolerably free, the pulse not hard, and the pupil, when we can see it, not contracted; the nearer the character of the delirium approaches to that of delirium tremens, the more safely may we use opium or morphia. In all questionable cases the latter is to be preferred.

When signs of phrenitis supervene, which they sometimes do, we must first inquire if there has been any retrocession of the eruption, about the head particularly; and if this appears to have been the case, we must apply a blister to the back of the neck. In cases where the very objectionable practice of applying cold to erysipelas on the head has been employed, a blister applied to the back of the neck has in most instances brought back the eruption and saved the patient. When the stomach is the organ particularly affected and there is obstinate vomiting, a blister or sinapism should be applied to the pit of the stomach, and Henry's calcined magnesia may be given to the amount of about ten grains, with about three of dilute hydrocyanic acid in an ounce of vehicle; or if there be much depression, the brandy and soda water recommended in continued fever, may be employed. The erysipelas of new-born children occurring within the month is always a most dangerous disease; many obstetric practitioners regard it as almost certainly fatal. The best mode of treatment is warmth, and the use of ammonia.

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* (98) ℞ Ammon. Sesquicarb. gr. v.
Tinct. Cinchonæ co. ʒ iss.
Decoct. Cinchonæ, ℥ ss.
Infus. Serpentariæ, ℥ i. Misce.
Ft. haust. 4^{ta} quaq. horâ sumend.

Another of the contagious exanthemata is plague, a disease which formerly committed great ravages in this country, and now at times prevails epidemically in the East, especially upon the shores of the Levant: it is therefore still deserving of serious consideration, but as the author has never witnessed it, he does not venture to describe it.

Another is the acute glanders, or acute farcy glanders, which we notice, since it has not very uncommonly presented itself in the wards of our metropolitan hospitals, but want of space compels us to be brief. It was first fully described by Dr. Elliotson. This disease has its origin in horses, and is highly contagious among those animals. It may, however, according to Mr. Coleman and other authorities, be generated anew when several of them are shut up together in a confined atmosphere, as often happens on board transports. It used to be supposed that the disease was confined entirely to the horse. A similar disease has, however, been so frequently noticed in the human subject, and traceable to contact with a diseased horse, that there is now no doubt entertained upon the subject.

There appear to be two distinct forms, or, if we might be allowed the expression, parts of this disease, which are each sometimes seen separately, just as we may have the throat affection of scarlatina without the rash, and the rash without the eruption.

The simple acute glanders commences with the ordinary pyrexia of a low type, stiffness and pains in the joint, and great thirst. The patient then complains of heat about the nares and larynx, whence there is a copious mucid discharge. The nose and surrounding parts become swollen, hot, excoriated, and livid; the eyes are inflamed as severely as sometimes happens in erysipelas; a tenacious mucous, at first yellow, but afterwards of a dark, sanious appearance, exudes from the nostrils and the eyes; hard inflamed pustules appear on and around the nose, and on the neck, back, arms, and thighs. The skin is hot, the pulse quick, soft, and undulating; the respiration hurried and feeble; the tongue reddish-brown and dry; the voice is weak, and there are low-delirium,—offensive sweats,—livid or gangrenous state of nose or adjacent parts,—tremors, restlessness,—death from asthenia : the fœtor from the discharges becoming intolerable towards the close of the disease.

The anatomical changes after death are gorged lungs, livid and congested bronchi, partially filled with dark mucus, a glutinous matter in the nostrils and frontal sinuses, the mucous membrane being studded with white granules ; irregular ulcers, like chancres, are sometimes found in the upper portion of the air-passages ; granules, similar to those in the nares, are also sometimes found in the intestines.

In the acute farcy, or farcy-glanders, there is fever of a similar character to that in simple glanders, but the disease is characterized by small tumours in different parts of the body, affecting, however, always much more one side than the other. They are painful, have a glossy red appearance, which soon changes to dark brown, and soon crack on the surface, and exude an acrid sanious ichor. There is a copious, offensive perspiration, watery stools, foul-coated dark-coloured tongue, livid and injected fauces, quick compressible failing pulse,—death from asthenia. On inspection, it is found that these tumours are deeply seated : they are covered by gangrenous integument, under which is a layer of brown glutinous matter, covering small white masses, like those found in the nares and frontal sinuses in acute glanders. For the account of the morbid appearances we are indebted mainly to Dr. Copland's dictionary ; the danger attending post-mortem inspections of this disease having afforded great obstacles to such investigations. When acute farcy and glanders coexist, we have the affection of the nares, fauces, and air-passages coexisting with the tumours just described, the constitutional symptoms and mode of death being little, if at all, affected by the complication.

Both the affections sometimes appear in a more chronic form.

The prognosis in the acute cases is very unfavourable, and the chronic form is a highly dangerous disease. As we know of no effective means of combating this horrible disease, we must look as much as possible to prophylaxis in the avoidance of the cause. There can be no doubt that in man it is contracted by communication with another person or an animal so affected : it is certainly produced by the contact of matter with an excoriated surface ; but whether in the human subject it can be communicated by the contact of matter with a sound mucous surface, or by simple infection, is not yet proved. Of the method of cure we know nothing : antiseptics may be applied to the surfaces, and the most volatile ones may be scattered over the bed-clothes, and put into an inhaler with warm water, and the fumes inhaled. The strength should be kept up by support and stimulants, much as in low typhus fever ; the combination of chlorate of potass and ammonia with tincture of cinchona and infusion of serpentary, would seem to be an eligible form of medicine. Powerful fumigations of turpentine have been found serviceable by veterinary surgeons in the treatment of this disease in the horse.

Not very different from glanders is a disease described by Dr. Burrows in the 'Medical Times and Gazette' for June, 1856. It was by him observed in young butchers who had wounded themselves in cutting up sheep's heads. It consists essentially of an abundant eruption of successive crops of vesicles and bulbæ of various sizes. These are in some parts isolated, in others confluent. They affect particularly the more delicate portions of the skin, and are also found upon the conjunctivæ and mucous surfaces of the mouth and fauces. There is also a mucous exudation, as in glanders. The appearance of the eruption is in parts like pemphigus, in others, like aggravated herpes. This disease, like glanders, appears to be in the highest degree dangerous: of its treatment we have nothing to add to what has been said of the preceding.

XXXII.

EPIDEMIC CHOLERA. INFLUENZA. HOOPING COUGH.

Epidemic Cholera.—This disease, when it runs its full course, terminates in a state which is unquestionably one of fever, and as that fever is often attended by a characteristic eruption, it appears to approach more nearly to the eruptive fevers than to any other class of diseases, yet to avoid the imputation of theory, we have not connected it with any.

In the larger proportion of cases, the development of this frightful disease is preceded by a premonitory stage, of which the symptoms are those of simple diarrhœa, though generally of a more than usually obstinate character. In some instances, too, the patient does not feel generally ill, and though, from the prevalence of the disease at the time, he may have some misgivings as to its true nature, he is willing to flatter himself, and eagerly assures his friends, that his diarrhœa is of a healthy or conservative character. In others, again, there is during this premonitory stage, more or less of a feeling of general illness; pains in the abdomen, and especially across the epigastrium; coldness of the extremities, slight cramp in the calves of the legs, exhaustion, anxiety, and alarm. After these symptoms have continued, in some cases for several days, in others for only a few hours, the true choleraic symptoms declare themselves more or less quickly.

Sometimes, on the other hand, the attack is fearfully sudden. The patient is seized without any previous warning, often about two o'clock in the morning, with a pain across the epigastrium, commonly attended with desire to go to stool; he does so, and passes a copious, often a bulky and healthy evacuation. This is very soon followed by another, and then another and another in rapid succession, the motions passing quickly into the true choleraic character, of a liquid resembling thin rice-water, sometimes even a limpid fluid, with just a few shreds of a white substance suspended in it. With this purging there is commonly vomiting, the matter ejected from the stomach being the same in appearance as that passed from the bowels. Sometimes the purging is so incessant, that the liquid streams from the patient without his having the least power to restrain it. There are now severe cramps, commencing generally in the calves of the legs, and extending to the abdomen and upper extremities, sometimes affecting even the muscles of the face, and not unfrequently, judging by the character of the pain, the diaphragm; there is also a total suppression of the urine, and, as may be inferred from the colourless appearance of the stools, of the bile also. There is urgent thirst; the patient is deathly cold to the touch, but complains much of heat; the skin streams with a cold perspiration; the extremities become shrunken and sodden, as if they had been long immersed in water; the hands and feet, and eventually the whole surface assumes a livid, leaden hue; the pulse becomes almost imperceptible at the wrist, sometimes quite so; the tongue is white and cold, the breath like a stream of cold air, and the surface of the body exhales a cadaveric odour; there is incessant jactitation of the limbs, resembling that of exhaustion by hæmorrhage. The cheeks are hollow, the countenance dark and dusky, and round the eyes, which are sunk in their orbits, there is a still darker circle. The voice is plaintive, and like a hoarse whisper, and startling the attendants by its unearthly sound.

In many of the severest cases, the purging ceases after it has continued for many hours, apparently because the system is thoroughly drained, and a state of most profound collapse may continue for many hours, when, if no reaction takes place, the patient dies.

The mode of death is somewhat remarkable: the organic life seems to be the first extinct, after that the animal powers of voluntary motion, and lastly the intellects, which remain undisturbed till death. This appears to be, in fact, a manner of dying different from those which we have hitherto noticed. It is not death from the heart, or death from the brain, but death beginning in the extreme circulation, the heart, and lastly the brain failing in their functions from want of blood, the supply of which is cut off by the drain from the mucous surfaces and the skin; or it may be said to be death from the blood, which when drawn is black and pitchy, from having been drained of its liquid.

If the patient do not die in this stage, reaction, as it is termed, ensues, the pulse returns at the wrist, and the skin recovers its warmth: after a time, the secretions of bile and urine reappear, and the patient, exhausted indeed, and emaciated, but apparently free from disease, steadily, and sometimes with astonishing rapidity, regains his health. In a large number of cases, unfortunately, it is not thus, but reaction leads to fever, and this fever is apparently of a specific character. After three or four days the patient begins to pass urine, generally of a dingy colour; there is frequent vomiting of a green, bilious fluid, and at the same time there are signs of stupor, or coma. The pulse is sharp, with a light back-stroke, and very compressible. Many—by far the greater number of patients thus affected—pass into a state of most profound coma, and so die.

In the course of the consecutive fever just noticed, an exanthematous rash frequently makes its appearance, which has been described by Dr. Babington, who was the first to call attention to it: "After this" (the typhoid consecutive fever) "has existed several days, some red spots are observed about the wrists and hands, and the face becomes tumid, as on the approach of erysipelas. If this occur in the evening, on the following morning the arms, the forehead, up to the roots of the hair, and the face generally, will be covered with large elevated patches, of a bright-red colour, more raised than measles, and more defined than scarlatina, much resembling nettle-rash, especially in the circumstance of their disappearance on pressure, and instant recurrence when that pressure is removed."

Such are the more prominent features of this frightful malady, which we have been compelled to sketch thus briefly. Into the different opinions which have been entertained respecting its pathology, we cannot of course enter, but we submit that which seems to us most in accordance with general pathology and the facts of the case.

The morbid anatomy of cholera tells us little, as no appearances have been found which in any way account for the symptoms. The most important are perhaps the capillary hyperæmia, the venous congestion, and the œdema, of the mucous membrane of the stomach and small intestines, more especially of the duodenum. There is, too, another, to which we believe an exaggerated importance has been attached, namely, the distension of the gall-bladder with bile.

The state of the intestinal membrane shows the irritation that has been set up there, and this, too, seems to show that there has been an arrest of the capillary circulation; that arrest being followed, as we have elsewhere seen to be the case, by an exudation of the watery parts of the blood; that this is so is further shown by the œdematous condition of the submucous areolar tissue. This seems to be the first link in the chain of diseased action which we are at present able to reach. But granting this, and that from hence the serosity of the blood is continually draining, the other phenomena follow as a matter of course; hence the thick tarry state of the blood, hence the suppression of urine (p. 27), hence the thirst (p. 78), hence the urea in the blood (p. 27), hence the suppression of bile (p. 27), hence the cramps, hence the failure, of the heart's action, of the circulation, and of the animal heat; hence the uræmic poisoning, and subsequent death by stupor or coma. We would here remark that some importance has been attached to the gall-bladder being full: now it does by no means appear that it proceeds from any excessive secretion, it is merely, as Dr. Gull has remarked, such a condition as is common when the digestive function is long interrupted, and indicates rather a passive than an active state; but, as the same physician remarks, there are cases where the membrane of the ducts and gall-bladder is the seat of the choleraic process. We believe that in many cases, the fulness of the gall-bladder is produced not by pure bile, but by choleraic effusion from its lining membrane, coloured by bile which had been already secreted. The seat, then, of the mischief is in the mucous membrane, beginning at the stomach and small intestines, and extending throughout its surface, so that the skin, which is one of its prolongations, is also similarly implicated, and further loss of fluid takes place from thence.

We may here remark that a frequent and troublesome sequel of cholera is gastric irritation, some patients being subject to it for months and years afterwards. In the consecutive fever, too, there was evidence of acute irritation of the gastro-intestinal mucous membrane. May not the rash have been an analogous affection of the skin?

The diagnosis of cholera, when established, is obvious. From the English cholera it may be distinguished by the absence of bile in the ejected matters, the voice, and the tongue. When there is premonitory diarrhœa, the signs of impending cholera are duskiness of the extremities, *cold tongue*, failing pulse.

The prognosis of true epidemic cholera is in the main unfavourable; at the commencement of an epidemic of cholera, nine out of ten die: upon an average, at least half of the cases of developed cholera. Towards the termination of an epidemic the proportion of deaths becomes small.

Of the causes of cholera we know but little; it may be said to prevail epidemically, though upon what this depends we know not, and this is not the place to enter into the nature of this epidemic influence: it is but little controlled by climate; it infests chiefly low situations, and the banks of rivers. Its spread is favoured by impurities in the air and water, and therefore by bad ventilation and drainage, and by neglect of personal cleanliness, and apparently by the defect of ozone in the atmosphere of large towns; by whatever, in fact, favours the spread of contagious diseases. Is it then contagious?—probably not highly so, but there can be no doubt that in many instances it has been conveyed by human intercourse. It affects mainly those in middle life, but no age is exempt. Debility may give some increased susceptibility, but the strongest and healthiest are not secure.

There can be no stronger proofs of the great fatality of this disease, than the variety of remedies which have been announced as of certain efficacy, and of which the worthlessness of most, and the perniciousness of some, has been found as certain. In the treatment of this disease all theories must be discarded. Many opinions which have been entertained as to its essence might at first sight appear as harmless as they are weak, were it not that they have been made the grounds of the most pernicious treatment.

Now we have pointed out the fact of the morbid action which takes place in the intestinal mucous membrane, and have traced its fatal consequences: the obvious indications must be to restrain this, and from the commencement of the premonitory symptoms to avoid everything that may aggravate it. The evil of neglecting to do this was forcibly illustrated in the case of a lady who at the commencement of the epidemic of 1854 rose one morning at seven with slight bowel disturbance; for this she took a table-spoonful of castor-oil, and was seen by the author at two in the afternoon of the same day, just as she expired in the collapse of cholera. In the commencement of the disease *check the diarrhœa.* This is best done by opium and astringents. If there be moderate diarrhœa let the ordinary combination (F. 99)* be employed, and enjoin strict rest, that is, confinement to bed, or, if not, to a couch; arrow-root and rice milk may be given, and if there be exhaustion let some brandy be added. If the diarrhœa increase, or if there be sickness, let a grain of calomel with one or two of opium, according to the urgency of the case, be given. If the choleraic symptoms appear to be setting in decidedly, give, in the first instance, half a drachm of compound chalk powder with opium, with half a drachm of sal volatile in cinnamon water; and if the diarrhœa be not checked, have recourse speedily to the calomel and opium. Many practitioners have a strong reliance upon calomel, and as it may help the capillary circulation, it is well to add it to the opium. The calomel and opium may be repeated for the first three or four doses every hour, and after-

* (99) ℞ Confectionis Aromat. ʒiiss.
Tinct. Catechu, ℥ j.
Tinct. Opii, ʒ ss—ʒ i.
Tinct. Cretæ, ℥ v.
Aq. Cinnam. quant. suf.
Ft. Mist. ℥viii. de qua sumat. ʒj. post sing. sed. liquid.

withdraw the opium. If the astringent mixture has no effect, about a scruple of the extract of logwood may be added to each dose, though it is liable to the objection that by discolouring the stools it may mislead us as to the character of any change taking place in the evacuations; or the gallic acid may be employed. (F. 100 * A saturated solution of gallic acid to the amount of about four ounces may also be injected into the bowel. We do not, however, place very much reliance upon enemata, since they are seldom retained, and the chief irritation is high in the small intestines. Thirst is an urgent symptom, and though water can rarely be retained, the patient may be allowed to drink freely, though not in large quantities. When the pulse begins to fail, about a table spoonful of brandy may be added to each tumbler of water. When the sickness is urgent, about four minims of dilute hydrocyanic acid, with half a drachm of compound spirit of ammonia, may be given in water every two or three hours. The latter is also a valuable adjunct to the diarrhœa mixture when there is much exhaustion. The placing a small piece of ice in the mouth often helps to check the sickness, and is a great comfort to the patient.

The measures which we have recommended are intended to carry out the principle of averting the diseased action from the organ or tissue, where that action is productive of the greatest mischief; and we would apply the same rule to the skin, which is similarly affected with the mucous membrane. The surface is exceedingly cold, and therefore it has been attempted to raise the temperature by great artificial heat; but this is as possible as it would be to warm a snowball without melting it. Any great heat and a load of blankets distresses the poor sufferer, and therefore it is best to consult his feelings in regard to clothes and temperature, though the apartment should be always carefully ventilated. We would not, however, by this mean to forbid the application of large sinapisms to the abdomen, which may have the effect of stimulating the capillary circulation; they are most beneficial at the commencement of the attack.

When the collapse takes place we believe that we can do but little. Some practitioners have great reliance upon repeated small doses of calomel, but we must not forget that scarce any medicines can be taken into the system when it is in this con-

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* (100) ℞ Acid Gallici. ʒss.
Tinct. Catechu, ℥j.
Tinct. Opii, ʒss.
Aq. distillat. quant. suf.

Ft. Mist. ℥vi. de qua sumat. part 6^{tam} 2^{da} quaq. hora. The laudanum must however be withdrawn when the collapse sets in.

dition. We have generally been in the habit of giving about five grains of chlorate of potass with eight or ten of carbonate of soda in an ounce of vehicle every two hours, and a grain of calomel in the interval. If the patient survive the collapse there is not uncommonly a distressing sickness, with vomiting of green bilious matter. We have found the best remedy to be about five grains of calcined magnesia in half an ounce of water every hour and a half or two hours. After the sickness has subsided, the chlorate of potass appears to act as a diuretic, and helps to restore the capillary circulation. The secondary fever has been, however, upon the whole a most intractable disease, and even when the secretion of bile and urine appeared to be healthily restored many passed into a state of coma. The urine which was first secreted was generally albuminous, but its becoming healthy did not insure an escape from the comatose symptoms.

Influenza or epidemic catarrh is a disease which requires only a short notice, although it is among the most fatal of epidemics; but we have already anticipated much that is to be said respecting its treatment. It has been termed epidemic catarrh, from the affection which is its most frequent attendant, but we believe that the morbid influence merely locates itself most commonly in the mucous membrane of the fauces and air-passages, but it often affects other tissues as well.

Influenza makes its attack generally with the symptoms of fever of an adynamic character. These are chills, rigors, extreme languor and depression, afterwards reaction, which is, however, feeble. The tongue is covered with a creamy mucus, the pulse quickened, rather sharp, but always compressible ; the skin is rarely very hot.

In some cases, after reaction sets in, which may be in a few hours, the patient breaks out into a free perspiration, and if he be prudent and avoid exertion and exposure, the attack passes off. In most, however, there is severe catarrh, extending far into the bronchial tubes; and when neglected, or when occurring in debilitated subjects, leading to fatal bronchitis, or peripneumonia notha. In some cases the lung becomes inflamed, in others the pleura, in others the pericardium or endocardium. In some instances, again, the encephalon is attacked, and there are some of the symptoms of phrenitis. Cynanche is also a common complication of influenza : so are sometimes diarrhœa, dysentery, erysipelas, and a low form of arthritis.

Influenza may be distinguished from common catarrh by the extreme debility, from mild fever by the extreme prostration, and in many cases by the appearance of an herpetic eruption round the mouth, from ordinary attacks of the inflammation which are apt to complicate it, by the tongue, the low form of the inflammation, and by the prevalence of the disease at the time.

During the prevalence of an epidemic of influenza, an attack of that disease is always to be regarded with apprehension; though in young and healthy subjects it is rarely fatal, unless some serious complication arise; but unless great care be taken, it is very probable that some such will occur. In old and feeble persons the prognosis is always doubtful; and if there be much tendency to chest-disease, unfavourable.

In mild cases the best treatment is that of common catarrh. Where there is considerable depression, ammonia should be added to the saline, and a few grains of Dover's powder given at night, the bowels being, of course, attended to. The treatment of the several complications must be that of those diseases themselves, with the qualification that the tendency is to asthenia, and that very few patients who are bled recover. And what is remarkable, in the influenza of 1847, loss of blood was often followed by furious delirium.

Hooping-cough is an epidemic, paroxysmal cough, mostly affecting children, the character of which is too well known to need much description. It generally begins with slight cough and difficulty of breathing, though often with but little signs of pyrexia; the cough by degrees assuming the well-known "whoop," and being followed by expectoration of a quantity of mucus, and in many cases by sickness, after which the child will appear well, and express a desire for food, most of which is rejected after the next paroxysm. Sometimes, however, when the paroxysm has been a severe one, he is left languid and powerless. The disease may continue for weeks, or months, or for a year. The popular notion is that it lasts till the May following its invasion.

Though children are the most frequently attacked by it, elderly and even old people have been often known to suffer from it: it perhaps depends upon a specific poison, and one attack generally insures an immunity for the remainder of life. It is generally believed to be contagious, and probably is so in some degree; but it is certainly much influenced by some epidemic temperament.

The danger of the disease consists in its liability to be complicated with severe bronchitis and pneumonia; and its remote ill effect, in its proneness to induce dilatation of the tubes or of the air-cells.

The treatment of hooping-cough, as long as it is simply such, should not be meddlesome: as it is a nursery disease there are many nursery remedies, of which the most harmless is the best. Bland nutritious diet, and a uniform temperature, are indispensable. Medical superintendence is also necessary to watch for the occurrence of the complications, which must be treated upon general principles. The combination of the conium mixture (F. 23, p. 220) with a little *dilute* hydrocyanic acid; two drachms of the mixture with one minim of the acid may be given to a child of four years old three times a day. After a time, if there be no fever, the ipecacuanha may be withdrawn, and the affection being now spasmodic, zinc may be given in doses of a quarter of a grain in the intervals. Change of air, if possible to the sea-side, will generally complete the cure.

XXXIII.

DISEASES OF THE SKIN.

We have before spoken of the exanthems or eruptive fevers, that is to say, fevers with eruptions; it now remains to describe very briefly those eruptions which are attended by little or no fever, and which used to be regarded as primarily diseases of the skin, and on that account are commonly spoken of as "skin diseases" *par excellence.*

We commence with those in which the alteration of the skin is the most simple, that is to say, in which the cuticle is not altered, the skin being red, sometimes elevated, and tender or irritable, but unbroken. Thus erythema is uniform redness of the skin, occurring in patches with some tumescence: it is, as a general rule, unattended with fever, though some febrile disturbance is apt to occur as a complication, so much so, that erythema was classed by Willan and Bateman amongst the exanthems. There can be no doubt that erythema, as well as other affections of the skin which are more or less inflammatory, will, when occurring in an aggravated form, excite some amount of inflammatory fever; neither is it unusual for any casual febrile excitement to induce here and there a local hyperæmia of the skin; still we believe that in either case the fever is an accidental, and not a necessary part of the disease, and that erythema is in itself a simple hyperæmia of the cutis occurring in large patches.

There is a curious form of this disease in which the margin of each patch is more elevated than the central parts, forming, as it were, a raised border. This form has received the name of *erythema marginatum.* There is also another, which is often attended with more or less febrile disturbance and considerable pain, namely, the *erythema nodosum.* It mostly attacks young women and boys, or lads of feeble constitution. It commences with slight febrile disturbance, after which red, elevated, roundish spots make their appearance on the legs, over the fore part of the tibiæ, and sometimes, though not so often, on the fore arms. It is important to be acquainted with this form of erythema, since the patches have sometimes been mistaken for nodes on the tibia, and sometimes for a modification of rheumatism. From the former it may be distinguished by its being moveable, and therefore unconnected with the periosteum, and from the latter by its situation, as it rarely affects the joints. When, however, there is much fever, the part should be carefully examined, as deep-seated mischief will, we know, give rise to an erythematous inflammation upon the integuments overlying it.

Erythema as such needs but little treatment. The erythema nodosum, which is the most painful and troublesome, requires the recumbent posture, gentle aperients and tonics. Of the latter, quina, or, for anæmic subjects, the quina with iron is to be preferred.

Urticaria, or nettle-rash, is a most annoying though not dangerous complaint. It consists of little weals or pimples, not unlike those produced by stinging nettles, and attended by much the same sensations; hence the name of the affection, from *urtica*, 'a nettle.' There is, however, this difference, that the weal produced by the real nettle is sometimes paler than the surrounding skin, whereas that of urticaria is always darker. The acute form generally commences with fever, which continues two or three days before the rash appears; it is also worst at night, when the itching is often almost intolerable. The disease also occurs in a chronic form, which, however, is not persistent, but disappears and recurs again, often in the evening. This variety has been termed urticaria evanida.

The cause of the acute form is generally an article of food which the stomach of the individual is unable to digest; and it is remarkable that there is a singular capriciousness in the human stomach in this respect, some persons having an attack of urticaria induced by an article of diet which for most people is wholesome, at all events not much otherwise, though it must be admitted that most of those substances which are notoriously apt to produce nettle-rash are not the most wholesome: such are bitter almonds, raw cucumbers, and mushrooms amongst vegetables, which are commonly considered esculent: and the same effect is sometimes produced by active drugs, as cubebs, capivi, pepper, and valerian. Shellfish, particularly mussels, will also produce the same effect, and so in some persons will soles or turbot (without lobster sauce). The taking of one of these substances has in some persons been followed by an attack of the acute form of urticaria in less than two hours.

The chronic urticaria is in some instances produced in the same manner as the acute, though it seems often to depend upon more permanent constitutional disturbance, and persists, notwithstanding the greatest care to remove and to avoid all substances which may be offending the stomach.

The obvious treatment for the acute or febrile nettle-rash is to expel the offending material, for which purpose, when the patient is seen early, an emetic may be given, and after that a moderate aperient. If the disease continues in spite of these remedies, gentle laxatives and antacids should be employed; such, for instance, as the carbonate of magnesia, with a small quantity of the sulphate, or the carbonates of soda and magnesia may be given in combination.

The more chronic form is often a most obstinate disorder. As a general rule, external applications are of but little service either in this or the acute form, but the disease evinces as much capriciousness in its remedies as in its causes. In some instances gently stimulating applications, as spirit lotions or sea bathing, have been of service, as also a change to a warmer climate.

Lichen is another papular eruption, the definition of which, as given by Dr. Copland, and which nearly coincides with that of Willan and Bateman, is as "an eruption of papulæ, of a red or white colour, clustered together or irregularly disseminated near the surface of the skin, attended or not with fever, or derangement of the digestive organs, usually terminating in desquamation, and very liable to recur."

Under this term may be included strophulus, if we adopt the amended definition just quoted, and which is nearly identical with that given by Dr. A. T. Thompson, from which he has expunged the words "affecting adults" used by Willan.

According to this simpler arrangement we may divide lichen into two forms, the lichen simplex and the *lichen agrius*. The *lichen simplex* consists essentially of an eruption of papulæ, containing neither pus nor serum. They are distributed over the surface, and are attended with intense heat, itching, and suffering. They first appear on the face and arms, and afterwards extend to the rest of the body. The eruption usually lasts several days and terminates in scurf. The febrile symptoms, if any, are generally slight. This simple lichen has been divided into several varieties according to certain peculiarities in the character of the eruption. Thus we have *Lichen pilarus*, in which the papulæ make their appearance at the roots of the small hairs on the surface of the skin. Lichen tendus, a somewhat rare form of the disease, most commonly seen in cachectic constitutions reduced by want or intemperance, in which the rash assumes a livid appearance not unlike that of purpura. *Lichen circumscriptus*, in which the papulæ are arranged in groups of a circular form with a well-defined margin. *Lichen urticatus*, in which the papulæ are larger and more elevated, and which is, in fact, very nearly allied to urticaria. *Lichen strophulus*, which includes several varieties of rash, occurring almost entirely in infants at the breast: the papulæ are sometimes red, scattered irregularly over the surface, the intervening spaces being marked with erythematous patches, constituting the *Strophulus intertinctus* of Willan and Bateman, commonly known as *red gum.* Sometimes the papulæ are small and very numerous, and aggregated in large red patches, constituting the *Strophulus confertus* of Willan and Bateman, popularly known as rank red gum. Sometimes the patches are white, constituting the *Strophulus albidus* of Willan and Bateman, or the *white gum.* All the varieties of strophulus are commonly connected with teething and gastric derangement, though they may occur spontaneously.

The other form of lichen, the *Lichen africus*, is of a more severe character. The papulæ are acuminated, of a bright-red colour, very numerous, and occur in clusters upon an erythematous ground. There is also considerable fever and gastric derangement. The itching is often most intense, so that the patient can scarcely refrain from scratching, which, however, aggravates the irritation, and by tearing off the tips of the papulæ causes small ulcers, from which a sero-puriform fluid exudes. The inflammation generally subsides, and desquamation takes place in about a fortnight. Sometimes, however, it assumes a chronic form, in which, in severe cases, the skin becomes thickened, indurated, and fissured. A troublesome form of Lichen agrius, is the prickly heat, or summer rash, which causes great annoyance in warm climates. It usually appears in the form of minute pimples of a vivid red colour, upon the chest, neck, arms, and thighs, and sometimes upon the forehead. It chiefly affects new comers to hot climates, though residents and even natives are not exempt from it. The lichen simplex requires but little treatment except gentle aperients when the bowels do not act freely, and the avoidance of irritative applications. Barley-water or thin gruel is often a soothing application. The infantile forms of lichen require careful attention to the bowels and to the gums.

Lichen agrius is a more troublesome complaint. For this, in the acute form, the treatment should be decidedly antiphlogistic, consisting of saline aperients and diuretics. When it assumes a chronic form it requires tonics, which may be given in the form of decoction of bark, or quina, with a little sulphuric acid. Sometimes iodide of potassia, with a little of the bicarbonate, in decoction, of sarsaparilla, will be of service.

Nearly allied to lichen is prurigo, or itching; so much so, that Dr. Barclay observes that the distinction between a lichen and prurigo is merely a question of words. Prurigo is, however, more diffuse than lichen, and the papulæ less distinct. In one very troublesome form—the prurigo pudendi—the eruption is often absent altogether, and the same is true nearly in the prurigo senilis, or prurigo of advanced life.

The prurigo pudendi is often the result of leucorrhœa, and is a common accompaniment of uterine disease. It is most common after the cessation of menstruation. The yellow wash or solution of bichloride of mercury in lime-water, in the proportion of twenty-five grains to a pint, is a useful application. The most important remedy, however, as well as primitive, in all forms of prurigo is scrupulous cleanliness. Itching of the genitals in either sex sometimes arises from the pediculi pubis, or crab lice. These will often be effectually destroyed by the application of a powder composed of equal parts of calomel and starch.

Scabies is another affection attended by incessant irritation, whence its popular name of itch. The eruption appears first in the form of small papulæ, which soon become vesicles with pointed watery heads. In some cases, especially in unsound constitutions, these vesicles, irritated by frequent scratching, from which the patient is unable to abstain, become pustulous, whence this form of the disease has received the name of Scabies purulenta. It is also placed amongst the 'Pustulæ' by Willan and Bateman.

The eruption affects most the hollows in the fissures of the joints, particularly the roots of the fingers and the wrists; but it may spread to every part of the body excepting the face, where it is rarely or never seen. This disease is essentially contagious, and the reason that it is so is that its alone cause is a parasitical insect, the *Acarus scabiei*, or itch-mite. This minute insect does not appear to inhabit the vesicle, as it is to be found near it, not in it. It is scarcely visible to the naked eye, but under the microscope is in shape not very unlike a cheese-mite.

We have here an explanation of scabies being contagious. It is communicated only by contact sufficiently close to enable the itch-mite to travel from one person to another. All may not be equally susceptible, or, in other words, every one may not offer a habitat equally to the taste of the animal. Certain it is that strumous children are more prone to be affected not only by entozoa, as in the case of worms, but also by external parasites, as, for instance, pediculi; and the same is, to a great extent, the case with adults. As there is one cause for scabies, so is there one certain remedy—sulphur, in the form of the sulphur ointment, which must be thoroughly well applied. Itch may sometimes occur where neither its name nor even that of its remedy is to be spoken. In these cases the smell and colour may be disguised by a little bergamot, and a little vermilion or rose powder. Thorough washing with warm soap and water should be used after the unction has been well employed for three days night and morning, and all clothes that have been infected should be burnt. The compound iodine ointment may sometimes be employed where it is inexpedient to use the sulphur.

Herpes is a vesicular eruption, of which the characteristic feature is that the vesicles occur in clusters, each cluster being upon an elevated red base. The different forms of herpes are seldom amenable to any direct remedial application, nor are they attended with any serious consequences, neither are they contagious. There are several varieties, with which it is well to be acquainted, as the *herpes oris*, which affects the margin of the lips, and is a frequent accompaniment of pneumonia, and used at one time to be regarded as almost pathognomanic. It may, however, be seen also in influenza and bronchitis. Herpes preputialis, so called from its affecting the prepuce, is a vesical eruption, often preceded by severe tingling in the part, followed by a crop of vesicles, which after four or five days fall off in crust. It is an affection in itself of no moment, but it derives importance from the possibility of its being by superficial observers mistaken for a syphilitic affection. *Herpes circinatus* is another form in which the vesicles are arranged in crescentic groups, and is one of the diseases commonly known as "ringworm."

The most remarkable form of herpes is the *Herpes zoster*, so called from its encompassing one half of the body like a zone or girdle. Its popular name is shingles, possibly a corruption of the Latin word "cingulus." The zone most commonly affects the trunk, often crossing one side obliquely from the spine to the linea alba; and there is a popular notion that if it passes either of these to the other side the patient dies. The explanation of this superstition probably is that it never does cross the median line. The substantial fact, however, which underlies all these appearances is that herpes zoster is an hemiplegic affection, and its being so certainly favours the belief that its cause consists in derangement of the nervous system. There are two other reasons for supposing this: thus its appearance is often preceded by severe pain in the part, and even after its subsidence these pains may continue. Sometimes there are no pains before its appearance, but the subsequent neuralgia may be very intense, and sometimes obstinate. A curious confirmation of the possible nervine origin of herpes occurred in the case of a young woman, a patient of the author's in Guy's, who was suffering from an affection of the fifth nerve on the right side, producing paralysis and partial anæsthesia, with at times intense pain in the face and in the inside of the mouth, and in whom there appeared a crop of herpetic vesicles on the inner surface of the cheek on the same side, and extending along the inner surfaces of the lips as far as the median line, but not crossing it.

Very little can be done or is required in the way of treatment as regards ordinary herpes. The application of a powder composed of equal parts of starch and oxide of zinc, will in some degree save the vesicles from irritation; and care must be taken that they are not broken by rubbing, as this sometimes leads to ulceration. The bowels must be attended to and the diet regulated. When the severe lancinating pains occur which sometimes follow herpes zoster, opiate liniments may be used. The carbonate of iron is also serviceable under these circumstances, or the more agreeable form of the ammonio-citrate may be employed.

Eczema is a vesicular eruption, distinguished from herpes by the vesicles not being disposed in regular groups, though they never occur singly, but numbers run into each other and form patches of uncertain size and form. The vesicles also are smaller than those of herpes. Sometimes the serum from the vesicles is continually oozing away, keeping the surface moist; or it may harden into a gum-like crust; or it may dry up altogether, and fall off in minute round scales. On the other hand, the cutis may become irritable, in consequence of the exposure from abrasion of the cuticle, and a puriform secretion may be poured forth similar to that produced by pustular eruptions. In these two cases care is requisite to distinguish the disease in the former case from psoriasis, and in the latter from the pustular disease, impetigo; not that the latter is of very great moment, since, when eczema assumes a pustular form, it may practically be regarded as impetiginous, and it matters little whether it be called one or the other, or eczema impetiginodes, or impetigo eczematodes.

The cause of eczema is generally some irritation of the surface, and the obvious remedy the avoidance of the irritating cause. Thus we have "eczema solare," from exposure to the solar rays, and the "eczema palmare," or grocer's itch, induced by the frequent handling of moist sugar. It sometimes affects the scalp, constituting the most frequent form of tinea capitis, or scald-head.

The most severe and troublesome species of eczema, and one which may be even dangerous, is the *eczema mercuriale*, or eczema rubrum mercuriale, which, as its name imports, may be induced by mercury, though it is not always so. It generally shows itself first in the groins. It is very red, and attended by much heat and itching, and in some cases it spreads over the whole surface of the body, which becomes covered with innumerable pimples with glittering vesicles. There is sometimes an intumescence of the face, like that from erysipelas, almost closing the eyes. The discharged matter, together with the exfoliated cuticle, often forms large scabs, or thick scales, which not unfrequently render it difficult at an advanced period of the disease to determine whether it has been originally vesicular or scaly. It is worthy of remark, too, that it sometimes supervenes upon the scaly diseases as the result of irritation of the skin. This distressing affection may continue for an uncertain time, terminating with the subsidence of the discharge and the desquamation of the cuticle.

This disease is rarely dangerous. It would be saying too much to assert that it is never so, where it has been induced in strumous constitutions by the excessive use, or rather abuse, of mercury.

All external applications should be of the mildest and most soothing kind, such as tepid water or barley water. Poultices are sometimes necessary to remove the hardening incrustations. Equal parts of oil and lime water may sometimes be smeared over the surface with advantage. Cleanliness and frequent changes of linen are indispensable.

Of internal remedies the best are gentle laxatives, diuretics, and, if necessary, opiates. Mercury is of course to be avoided.

Eczema infantile is a very troublesome complaint in young children. It often arises, to all appearance, spontaneously. It usually yields to mild mercurial alteratives, such as a quarter of a grain of calomel with dried soda and compound chalk powder every alternate night, and emollient applications, such as barley water or strained gruel. If the eruption assumes a more puriform character, the ointment composed of equal parts of Unguent. hydr. nit. ox. Unguent. zinci and Cerat. Plumbi acetat. may be applied. It is however by no means safe to check eczema by external application, especially when it affects the scalp, without carefully watching the health of the child, particularly as regards the condition of the bronchial membrane and of the brain.

Nearly related to the vesicular diseases are the *bullæ.* Now a bulla is a large vesicle, and of this we have the best example in the disease called by some writers *pemphigus,* and by others *pomphylix.* They were formerly regarded as distinct affections, and were classed by Willan and Bateman as such, those cases in which the bullæ were larger being called pomphylix. *Pemphigus* is defined by Dr. Bateman as an eruption of a transparent yellow-coloured bullæ of considerable size, appearing in circular or oval erythematous patches, nearly corresponding, in diameter, with their bases, terminating by effusion of the fluid they contain, and by the formation of lamellar incrustations, or by excoriations. The bullæ vary in size from that of a pea to that of a hen's egg, and are formed by the effusion of serum between the cutis and the cuticle. The eruption begins in small points, and is attended with a pricking sensation in the centre of each. The cuticle becomes raised by the effusion of limpid serum, at the same time the circumference enlarges, and the bullæ or blebs are rapidly formed. The serum in three or four days becomes opaque, and the blebs pearly. Some of the blebs, however, burst early, and the serum oozes out.

Pemphigus may be either acute or chronic. The acute form is very rare. It is generally a mild disease, the eruption being preceded by a slight pyrexia of about ten days' duration. The bullæ generally run their course and dry in about five days. The desquamation is not complete till the fourteenth, so that when the whole crop appears at once the disease subsides, at the end of from seven to fourteen days. There is a more severe form of pemphigus which attacks children, the *Pemphigus infantilis*, called by some writers Pemphigus gangrenosus, which sometimes assumes a fatal character. It is chiefly seen in lying-in hospitals and ill-ventilated and uncleanly dwellings. The bullæ are numerous and confluent, and sometimes exhibit a tendency to sloughing. Acute pemphigus may also occur as a complication or sequela of eruptive fevers; and owing to this circumstance it has sometimes been regarded as contagious, which it is not.

The chronic form is more common, and it is a tedious complaint, a succession of bullæ arising in various parts of the body, and bursting, and often leaving painful excoriated patches; and the recurrence of the blebs, and consequent incrustations or excoriations, may continue for several months, or even years.

In the mild cases of acute pemphigus but little treatment is necessary, or even desirable. In the pemphigus of infants decoction of bark with chlorate of potass, or, if the urine be very acid, ammonia and bicarbonate of potass may be employed, good support being given at the same time.

The chronic pemphigus often resists the most assiduous, careful treatment. It is in this disease necessary to attend carefully to the state of the secretions, both as regards the bowels and the urine. Emollient applications should be applied, and, when not contra-indicated, the nitro-hydrochloric acid may be given internally in decoction of sarsaparilla or of bark. Dr. Graves of Dublin once succeeded in curing this disease by opening all the bullæ with a lancet and touching the excoriated surface with nitrate of silver, and then applying the caustic around the base of the bullæ, the pimples or young blebs being all treated in the same way.

The scaly diseases, or squamæ, are characterized, according to Bateman, by "an eruption of scales, consisting of laminæ of morbid cuticle, hard, thickened, whitish, and opaque, detaching itself from the skin. Scabs, when they increase into irregular layers, are denominated crusts."

Lepra psoriasis and some syphilitic eruptions are the diseases of this class with which we are most concerned.

Lepra is a very common disease, that form most frequently met with being called lepra vulgaris. The scaly patches are of various dimensions, but almost always of a circular or oval shape. It is curious that at the commencement of the disease the patches occur symmetrically as regards the two sides of the body. The eruption generally enlarges gradually and occupies a large portion of the trunk and extremities. It rarely affects the hands or the scalp, in which respect it differs from psoriasis. It very generally attacks the legs just below the knee, and the fore-arm just below the elbow; but, excepting in the syphilitic form of the disease, it does not cover the knees or elbows themselves. When the patches heal they do so from the centre outwards. Sometimes the eruption runs rapidly through these different phases, but at others it persists for months or years. When the patches are small and of a glistening white this disease is known as lepra alphorides. Lepra is not contagious, neither is it attended with any febrile excitement.

Psoriasis is an affection closely resembling lepra, the chief difference being in the size of the spots, which in psoriasis are rather small, as in psoriasis guttata, or consist of single larger patches. In lepra the crusts are more adherent, and consequently thicker and whiter than in psoriasis.

In both these affections there is generally more or less constitutional derangement; and the moderate use of aperients will generally be serviceable in effecting a healthy condition of the secretions. Various other remedies have been recommended, both internally and externally. The more useful of the former is the liquor potassæ, in doses of fifteen or twenty minims, in about a wine-glassful of barley water. Warm baths have the effect of clearing the skin without irritating it; where the surface is not inflamed, the pitch ointment may be used.

Ichthyosis, or fish-skin, was placed by Willan and Bateman amongst the squamous diseases. More recent authors, and amongst them Dr. Copland, have denied the accuracy of this qualification. The latter writer gives the following definition of it: "Morbid enlargement of the papillæ of the skin, and thickening of the lamellæ of the epidermis, either in parts or over the general surface, presenting irregular compartments, and resembling in many cases the scale of fish. This disease in its most severe and well-marked form is generally hereditary and often congenital. A form of this disease distinct from the above is produced in somewhat the same manner as are corns. Thus it may be seen on the lower and anterior parts of the thighs of shoemakers, and on other portions of the skin.

The hereditary or congenital ichthyosis has been rarely if ever permanently cured. The most successful treatment, however, appears to have consisted in large doses of pitch internally (in a case related by Dr. Elliotson to the extent of three drachms three times a day); and diligent inunction with sweet oil. For the local or accidental ichthyosis, topical stimulants, or even flying blisters, and friction with flannel, after a tepid sulphureous bath, have been recommended; the affection is, however, very little amenable to treatment.

Of the pustular diseases of the skin, the most frequent and important is *impetigo*. Of this the following definition is given by Dr. Copland: "An eruption of one or more crops of small, yellow, itching pustules, disseminated or collected in clusters, the contents of which dry up in a short time, and assume the form of yellowish, rough, or prominent incrustations; generally unaccompanied by fever, and not contagious.

There are various forms of these eruptions. The *Impetigo simplex*, which is a disease mostly of childhood, generally occurs without any premonitory febrile disturbance, often at the period of dentition, and is common in young persons of sanguineous and lymphatic temperament. The *impetigo figurata*, which is perhaps the commonest form, may attack any part of the body, but most frequently the face, often in the middle of the cheeks, commencing in a small patch, and extending in a circular or oval direction. We have also impetigo sparsa, and a variety of eczema, sometimes called impetigo eczematodes, to which we have already alluded under the name of eczema impetigonodes, which is perhaps the more appropriate; there is also the impetigo erysipelatodes.

In the more acute form the treatment should be of the most soothing character. Gentle purgatives, sometimes salines, with a little wine of antimony or ipecacuanha, or alkalis may be used internally, and a weak spirit lotion, or a lotion of bicarbonate of soda, with a little dilute hydrocyanic acid, may be applied externally. Greasy applications should be avoided; but when the disease assumes a more chronic form, a lotion of oxide of zinc is often highly serviceable. It may be employed in the proportion of fifteen grains to an ounce of water or rose-water, or the zinc may be powdered over the part.

Ecthyma consists of large and solitary pustules, which, however, show a tendency to aggregation by being found together on one limb and nowhere else. The pustules are much larger than in impetigo, and the cutis is much more deeply affected, there being often an ulcer under the dry crust formed by the pustule.

In this respect ecthyma resembles *rupia*, which is an affection, in the first instance, perhaps vesicular, though the vesicle approaches nearly to a bulla, which dries into a scab, over which there is often a deep ulcer. In one form of rupia, the *rupea prominens* the continual increase of the scales, especially towards the centre, gives it the form of a limpet-shell. Both ecthyma and rupia are mostly seen in cachectic states of the system, especially in those whose constitutions have been impaired by syphilis, mercury, or intemperance.

Acne and *sycosis* are names applied to suppurating follicles, so that, as Dr. Barclay observes, a common pimple may be called acne; but a person is said to be suffering from acne when there is a tendency to the recurrence of these unsightly pimples and a tardiness in healing of the suppurating points. The milder forms of acne are known by the names of acne simplex and acne punctata; the more obstinate form, where there is not only the tardiness of healing just alluded to, but a livid induration remaining for some time afterwards is named *acne indurata*.

There is also another form, the acne ensacea, which deserves attention, namely, the acne rosacea or rosy-drop, consisting of small, slowly-suppurating pimples of a shining redness, giving an irregular granulated appearance to the part affected, which is commonly, at first, the end of the nose, the eruption afterwards spreading on each side to the cheeks. It mostly affects those who have indulged freely in ardent spirits, though all persons in advanced life are liable to it.

The term sycosis is restricted to suppuration of the follicles at the roots of the hair. A troublesome form of this is the *sycosis menti*, affecting the chin, as its name imports, and apt to be much aggravated by the operation of shaving.

The treatment of acne in delicate constitutions should consist mainly of gentle laxatives and light tonics, the function of the skin being at the same time promoted. With this view sulphur and bitartrate of potass may be given in the morning and some lenitive electuary at night. And afterwards the infusion of gentian or calumba, with a little mineral acid, may be used. When there is much irritation a lotion of liquor ammoniæ acetatis and rose water, or of glycerine, in the proportion of two drachms to an ounce of rose water, may be applied.

For sycosis the best remedies are the avoidance of all local irritation, attention to the state of the stomach and bowels, emollient applications, and when the irritation has subsided, the use of the lotion of bichloride of mercury and lime water.

The skin is also liable to be affected by vegetable parasites, which used to be regarded as pustulous or other eruptions. The most important of these, is the *favus* or *porrigo favosa*, which has its nidus in the hair follicles. It rapidly increases, and if unchecked forms large dry crusts, almost like mortar cast upon the surface of the skin. It is apt to be confounded with impetigo, but the latter may be distinguished from it by the fact of the crusts being formed by the hardening of a puriform exudation, and always being attended by some trace of this secretion, which may be seen, for instance, upon the cutis when the incrustation is removed by a poultice.

Porrigo decalvens is another parasitic affection, in which the hair falls from the scalp in circular patches. There are no vesicles or papulæ to be discovered; but the cause of this destruction has been discovered to be a microscopic fungus. In this class is included the tinea capitis, the contagious ringworm.

Pityriasis versicolor has the appearance of a squamous affection, the squamæ being apparently of very minute size. It consists of a brownish discolouration occurring in small circular patches, which sometimes spread over a large surface. There is no vesication, but a considerable desquamation of the epidermis, and much itching. The disease is now shown to be associated with the growth of a fungus. These affections are mainly dependent upon local and extraneous causes. There can be no doubt, however, that, as in the case of entozoa, there are some constitutions which render the surface more favourable than others to their generation and development; and this is perhaps especially the case with strumous children and young persons. Whilst, therefore, we apply local remedies, we must not omit the use of both internal and other means as appear most likely to improve the general health. For the former purpose the cleansing the surface with poultices, and the application of an ointment of equal parts of the ointments of zinc and nitric oxide of mercury and the cerate of acetate of lead will be useful for the latter purpose. The constitutional treatment to be adopted is that which has been already recommended as applicable to the scrofulous diathesis.

In persons of scrofulous constitution we not unfrequently meet with scrofulous ulceration of the skin. They often show themselves on the side of the neck and the back of the head, these abscesses terminating in scrofulous ulcers. For this affection the treatment must be almost entirely constitutional and adapted to counteract the scrofulous tendency. The syrup of the iodide of iron will be found a most useful remedy internally.

The limits assigned to this work compel us to close this brief summary of the diseases of the skin with the notice of two which are commonly reckoned amongst them, and are of considerable importance in practice—*Purpura* and *Scurvy*.

Both these diseases consist in a subcutaneous hæmorrhage, which arises without any pain or previous injury, and for which no cause can be assigned beyond some peculiar condition of the blood or of the capillaries, or of both. Purpura is first detected by the appearance of rather dark-red persistent spots of small size, the skin appearing to be thoroughly dyed with stains of a dark blood colour. The spots are circular, and sometimes innumerable, smaller ones rise together, and form large patches. These patches, after a few days, fade into an orange colour, and leave a mark like that of a bruise. Fresh ones are, however, successively appearing, so that the eruption may continue for several weeks.

Purpura is divided by systematic writers into several varieties: of these the chief are, 1. *Purpura simplex.* This variety is preceded by some constitutional disturbance. There are languor, muscular debility, weakness of the joints, and pain in the limbs, with a sallow complexion, weak, soft, and irritable pulse, loaded tongue, which is indented by the teeth. The bowels are generally confined, and the stools offensive. The urine is high-coloured and becomes turbid upon cooling. The spots of ecchymosis may affect the surface more or less extensively, but they commonly show themselves chiefly upon the legs. The face is rarely affected, though there are sometimes spots on the conjunctivæ. 2. The *Purpura hæmorrhagica*, which is preceded often for some weeks by signs of depression, much like those of the preceding variety, but in a greater degree, though it sometimes, but very rarely, makes its attack suddenly. It is always, however, attended with considerable prostration, and frequently with signs of deranged function of the liver, a circumstance worthy of note in connection with the observations we have already made of the great tendency to hæmorrhage which exists in jaundice. Often there is considerable distension of the hypochondrium. The breath is fœtid, and there is an offensive odour of the surface. The pulse is sometimes slow, but it is always compressible and irritable. In this case the spots are often interspersed with patches of ecchymosis, and often there are large marks like bruises.

The characteristic feature, however, of this variety, from whence it derives its name, is the tendency to extravasation in other parts besides the skin, especially the mucous surfaces. Thus the gums are tender, and there is frequently hæmorrhage from the bladder or intestines. In fatal cases, too, spots of ecchymosis are often found in the serous cavities and on the surface of the brain, and frequently there is extravasation into the parenchymata of the lungs, liver, and other solid viscera.

The *Purpura urticans* is spoken of by Dr. Copland as a rare variety of the Purpura simplex. It derives its name from the spots first appearing as small reddish elevations like nettle-rash, but without the tingling or itching of that eruption. These papulæ or weals gradually subside, and at the same time assume the character of the spots of purpura. The eruption sometimes commences in the joints, and is preceded by a painful swelling, which has led to its being at first mistaken for rheumatism.

Closely allied to purpura, especially to Purpura hæmorrhagia, is the well-known sea-scurvy, in which the ecchymoses appear in large blotches upon the shins, calves of the legs, and thighs, and afterwards affect the arms, trunk, and even the scalp. Their appearance is generally preceded by great depression, or rather dejection of spirits, a bloated countenance, a dingy or greenish hue of the lips, spongy gums, and pains in the lower extremities like those of rheumatism; and the legs and ankles are often œdematous. The essence of this disease, if we may so speak, consists in the deficiency of the salts of potass in the blood, and the cause of this deficiency is the privation of the vegetables from which it is probable that the blood mainly derives its supply of them, such as potatoes, cruciferous plants, &c., which, long before the true nature of the disease, or the cause of their remedial agency was known, experience had taught practical men to regard as antiscorbutics.

It will be at once apparent that the causes of the different forms of this disease, each of which manifests itself in a subcutaneous extravasation or ecchymosis, must be various. Of the simple, as well as of the hæmorrhagic form, the cause, according to the most elaborate pathological investigations, of which a careful account has been given by Dr. Habershon in the 'Guy's Hospital Reports' for 1857, is to be found probably in disease of the spleen and liver, the most uniform morbid appearance in fatal cases being enlargement of the Malpighian bodies of the former.

The complicated purpura, which occurs in connection with general capillary obstruction, is, in fact, the effect of mechanical obstruction to the return of the venous blood towards the heart, and of the changed condition of that fluid itself, resulting from the engorgement of the liver and spleen.

The Purpura urticans is perhaps more nearly allied to the exanthems, and is the result probably of severe acute, and possibly specific hyperemia of the skin analogous to that which occurs in those diseases.

The scurvy we have said to be nearly allied to purpura hæmorrhagica, though not identical with it, the general immediate cause of the latter being a changed condition of the blood, the nature of that change being, however, not always the same. In the case of Purpura hæmorrhagica we know that there is disease of the liver or spleen, or both; and we know, also, that the healthy condition of those organs is essential to a normal condition of the blood, though the nature of the morbid changes in the blood has not yet been accurately ascertained. In scurvy, on the other hand, it has not only been shown that the disease is induced by feeding upon salt meat and by the privation of fresh vegetables, but the researches of Dr. Garrod have proved that the morbid change thus produced is from a deficiency of the salts of potash, a change which does not exist in the purpura. It used to be supposed that a cold climate was essential to the production of sea-scurvy, and probably it is favourable to the development of the disease; but experience has shown that in the hottest climates ships' companies are not exempt from its attacks when confined to the use of salt provisions. The same disease may also occur on shore under similar circumstances as regards diet; and it is remarkable that in the cold spring which followed the potato famine of 1846, and during which there was a great scarcity of fresh vegetables, scurvy often presented itself in the admission rooms of the hospitals of this metropolis.

The treatment of the severer forms of purpura is as unsatisfactory as our knowledge of its pathology is imperfect. Though we have not the same obvious indication for the use of vegetables as in the scurvy, experience tells us that where the patient has been, from indigence or other circumstances, deprived of them, they should be supplied to him, and he should, in other respects, be allowed a good nourishing diet. Where there is a scarcity of vegetables lemon juice may be employed as a substitute, though it is not the specific in this disease that it is in scurvy.

In mild cases of simple purpura the tincture of the sesquichloride of iron is a useful remedy, and to this may be added the disulphate of quinine, especially where the disease, as is not uncommonly the case, occurs in those who have been exposed to marsh miasm. Dr. Hunt recommends arsenic, and in this he is supported by Dr. Habershon. In one case in which the author prescribed it at Dr. Habershon's suggestion, the patient ultimately recovered, and certainly appeared to derive considerable benefit from its use, though his health was not restored till he had been put upon a course of iron. The patient must be kept in a recumbent position until several days after the spots have entirely disappeared, and even then we are exposed to the disappointment of seeing them return when he sits up. The Purpura hæmorrhagica is a disease which is often rapidly fatal, and it is one against which we possess no remedy upon which reliance can be placed. Purgatives of magnesia and mineral acids have been recommended by authors of high authority. Dr. Copland speaks strongly in favour of turpentine. The late Dr. Hughes relieved several patients by the administration of rum punch, which we would recommend as a drink, giving at the same time a generous diet, and the sesquichloride of iron in combination with quina.

The cure for the scurvy is the potass contained in potatoes and most green vegetables, and in lemon juice, and where these, with fresh meat, can be procured, the recovery of the patient is in most cases certain. Where fresh meat and vegetables cannot be obtained, the most efficient remedy, as well as preventive, is the lemon juice; and ships' companies should never be kept for more than a few days upon salt provisions without being served with a regular supply.

Syphilitic Eruptions.—Before concluding entirely the subject of diseases of the skin, we would briefly allude to syphilitic eruptions, which, though they have had no place assigned to them amongst such diseases, can, according to the form in which they manifest themselves, claim to be classed almost with any of them, and are in themselves highly important in a practical point of view, since such eruptions are, in reality, mere evidence of a general specific disease in the system, and unless the remedies employed be directed to the eradicating this taint, all treatment applied to the disease, viewed simply in the light of a skin disease, will be futile.

These eruptions may assume every form of skin disease except the vesicular, in which they scarcely ever appear. Their characteristic feature is the copper-coloured hue of the surrounding skin, though this sign alone must not be considered a proof, since other eruptions do occasionally leave such a discolouration on healing, and syphilitic eruptions are sometimes, though rarely, free from it. We must therefore inquire diligently into the history, which, however, we are often unable to do by direct questions, and first endeavour to ascertain whether the patient have had any of the constitutional symptoms of the syphilitic poison, such as sore throat, periosteal pains, iritis, or loss of the hair.

As regards the eruption itself we often find a want of its true characteristics, and a tendency to run into another form. Thus urticaria sometimes becomes more of a dingy brown instead of purple, as it dies away, and has a tendency to desquamate like psoriasis or lepra: lichen becomes larger, and has a decided scab on the summit of the papule, the scaly eruptions being more tubercular.

In the pustular eruptions suppuration penetrates deeper, and often there is an elevated and hardened margin to the ulcer thus formed; and where there are any of these suppurative forms of disease, we often see ulcerations of the angles of the mouth.

In congenital syphilis in young children, we generally see copper-coloured papulæ on the thighs, nates, and pudendum, ulcers at the angles of the mouth, running of the nose, and emaciation.

The most efficient treatment for most of these syphilitic eruptions is a course of iodide of potassium: about three grains three times a day may be given with about ten of the bicarbonate in decoction of sarsaparilla, and, where there is fair constitutional power and no disposition to ulceration of the gums or angles of the mouth, about five grains of Plummer's pill may be given every night. Some cases which have resisted these remedies have yielded to a course of nitric acid and decoction of sarsaparilla. In the congenital syphilitic eruptions of young children the best remedy is a grain of the hydrarg. cum cret. night and morning. This may, after a time, be followed by a course of iodide of iron or ol. morrhuæ.

XXXIV.

DISEASES OF ADOLESCENCE AND PUBERTY.

The different periods of life are, each more particularly obnoxious to different diseases, and this is especially the case with regard to youth and adolescence. We do not by this allude so much to the structural diseases of the sexual organs, the discussion of which, as regards the female, belongs more to the works of the obstetrician, and as regards the male, to those of the surgeon; but to changes which take place in the relative proportions of the different parts of the body during youth, a period which may be termed that of the transition from childhood to manhood or womanhood. To this we have already alluded in reference to the development of tubercle.

One great change which takes place at this time is in the relative size of the extremities and the trunk, and of the chest and the abdomen; and the reason of this is, that, as the extremities acquire their full proportionate development, there must be an increase in the quantity of blood sent to the right heart directly through the cavæ, as compared with that which finds its way by the more circuitous route through the portal system; at the same time there must be a demand for a greater activity in the decarbonizing action of the lungs. This is remarkably shown as regards the latter by the observations of Andral and Gavarret, from which it appeared that in the male there was at the period of puberty a rapid increase in the volume of carbonic acid daily evolved by the lungs, that afterwards it continued slowly to increase till perfect manhood, and about the age of forty-five began to decline. Now the inference from this as regards the male subject is obviously this—that if the lungs themselves be unsound, or if there be any causes impeding their development, such as narrowing of the air passages, contraction of the chest from old pleuritic adhesions, or the effect of pericardial adhesion acting immediately through the impediment which it affords to respiratory movements; or if there be obstruction to the pulmonic circulation, either from disease of the mitral valve—dilated bronchial tubes, or the effects of old bronchitis, it will be at this period that the effects of such defective development may be expected to show themselves: (see 'Guy's Hospital Reports,' 1st series, vol. vi., pp. 1 and 467,) and they will consist mainly either in disorganization of the lungs, or—enlargement of the right heart, engorgement of the liver, ascites, and general dropsy.

In the female the progress of the activity of the respiratory function is still more remarkable. In the girl it goes on increasing, as in the boy, to the age of puberty; but when menstruation is established, instead of a further and more rapid increase, as in the male at the same age, the increase in the daily evolution of carbonic acid is arrested; but should the catamenia be checked, there will be an increase in the evolution of carbonic acid until they are restored. It is remarkable, also, that in the female, although the rate of mortality is low between fourteen and eighteen, it nevertheless exceeds that of the male by 1·28 to 1·.

We perceive, then, the important connection between the uterine functions and the organs of respiration, and also that if there exist any of those circumstances which have just been enumerated as preventing the development of the latter, an irregularity in the former must tend greatly to aggravate the ill effects which may be anticipated. And that such is the case is confirmed by experience; for instances have occurred in which, from early rheumatism and carditis, there had been narrowing of the mitral valve, but in which menstruation became established, and the pulmonic obstruction relieved, and the patient went on in tolerable health till the age when that function might be expected to cease, and then the dyspnœa, engorgement of heart and liver, and subsequent dropsy, quickly ensued.

Independently, however, of structural lesion, there appears in the female to be sometimes a want of power in the system to establish the catamenial functions; in other cases, again, it is arrested when so established.

Hence we have two varieties of amenorrhœa, which are termed in the former case *emansio mensium*, and in the latter *suppressio mensium*; but there is besides another distinction of equal or even greater practical importance, and that is between amenorrhœa with anæmia and amenorrhœa in a plethoric subject. The former is termed amenorrhœa with chlorosis, and the latter simple amenorrhœa.

Amenorrhœa with chlorosis, when appearing in the form of emansio mensium, is characterized by, delayed development of the mammæ, and general anæmia; with suppressio mensium there may be full development.

Amenorrhœa with chlorosis, then, is associated with anæmia, and is probably its effect; the feeble powers of the system, as evinced by the deficiency of red corpuscles not being adequate to the supply of blood for the purpose. These cases are characterized by the white lips and white cheeks, with sometimes a sallow, greenish hue, the pearly conjunctivæ, the dark areola round the eye. There are commonly dyspnœa and palpitation; there is an anæmic murmur in the ascending aorta, plainest, according to Dr. Hughes, where that vessel overlies the pulmonic artery. There is general weakness and inability for exertion, and the legs and feet are commonly œdematous towards night; the nervous system is highly susceptible, and such patients are morbidly timid, and often hysterical. As an additional cause of weakness, there is often leucorrhœa.

This form of amenorrhœa is most common in towns, and is no doubt much favoured by the want of pure air and sunshine.

It must obviously be unreasonable to attempt to relieve such cases by any measures calculated directly to induce or restore the uterine functions, since their non-performance is often a conservative precaution on the part of nature, to save the power of the system. Iron, indeed, has the reputation of being emmenagogue; but it is because it is tonic, and promotes the formation of red corpuscles, and the strength and material being given, the function is performed. The iron may be exhibited in the form either of ammonio-citrate or ammonio-tartrate, or the compound iron mixture of the Pharmacopœia. The two former are the least offensive, and are not so apt to induce headache. They may be given in solution, and as the bowels are generally costive, some aperient pill should be given every night or every alternate night. For the latter reason an excellent form is the combination of the iron mixture with the compound decoction of aloes. Where there is much leucorrhœa, the solution of alum and zinc should be used as an injection per vaginam.

In the cases of amenorrhœa without chlorosis, the cause of the non-performance of the function is probably dependent upon congestion. The subjects are generally, florid, stout, full-bosomed girls, who, nevertheless, have often a feeble circulation. Exercise, free purging, the application of a few leeches to the groins or inside the thighs, when the period comes round, are the best remedies. Many practitioners have faith in the madder and hellebore as emmenagogues.

Dysmenorrhœa is one of the most painful affections which we are called upon to treat. Most females for a few days before the return of the period, and the appearance of the catamenia, suffer from slight febrile disturbance, with pain in the loins and weight in the iliac fossæ, and across the pubic region, showing that there is an amount of periodical congestion for which the catamenial discharge affords a periodical relief. In some, however, this congestion appears to assume the form of inflammation; and we have intense pain in the iliac fossæ, and down the inside of the thighs, with furred tongue, rather sharp pulse, torpid bowels, and sometimes high-coloured urine. Under these circumstances, it may be well to apply a few leeches to the iliac fossæ, or inside the thighs, especially if there be a delay in the appearance of the discharge; and hot fomentations may be applied to the lower part of the abdomen: but the remedy which we have found most effectual is about half a grain of calomel with one grain of camphor and three of extract of hyoscyamus, three or four times a day, the bowels being kept moderately free, and the hip-bath employed at night. This treatment should be commenced as soon as the premonitory signs of menstruation make their appearance.

Hysteria is another affection closely connected with uterine derangement in females, and it is from thence that it derives its name. To describe its various phases, would exceed our limits; there is no disease which it may not simulate, but it should be remembered that there is none which it may not mask. The well-known hysteric fits are perhaps the effect of excessive polarity of the spinal cord, that of the brain being diminished; such a state of things is more apt to exist in the female than the male, especially if there be a tendency to chlorosis; and when we consider the vast supply of nerves distributed to the uterus, we cannot be surprised at the ready excitement of spasm or convulsion from irritation of that organ. Another remarkable phenomenon in hysteria is a strange perversion of the moral feelings, evincing its presence in fondness for simulation. Thus delicate females will not only feign disease of the bladder, rectum, or uterus, but even some which may subject them to painful operations. Sometimes, again, there is a species of delirium, of which one of the most remarkable characteristics is that young females, often young ladies, will use obscene expressions and sometimes sing songs with which we could hardly believe that they could have been acquainted.

In the management of hysteria we must look first to the natural functions, and especially those of the bowels and the uterus, and there are few better remedies during the paroxysm, than cold affusion.

In the intervals of the paroxysms, the valerianate of zinc, in doses commencing at about a grain, and gradually increased, will often have the effect of preventing them.

In the hysteric mania the combination of camphor and henbane, and the occasional use of assafœtida injections, will be very serviceable. After the maniacal excitement has subsided, the valeriate, or sulphate of zinc may be employed: but more important than these are moderate exercise for the body, and rational employment for the mind. We have already hinted that in several spasmodic diseases the automatic functions are in undue action, whilst the voluntary power is in abeyance; and this is the case in hysteria; but beyond this, there is an increase in the emotional susceptibilities, and diminution in the controlling power of the reason. To subdue the former, and strengthen the latter, should therefore be a leading object. For this reason, moderate intellectual exercise is to be encouraged; but the stimulus of much that is termed light literature is to be discountenanced. Rational society is to be sought, but dissipation shunned. Religion, in its truest sense, is as healthful, as sentimental religionism is pernicious.

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ERRATA.

Page 231, line 5 from the top, *for* "intestinal," *read* "interstitial."
,, 540, line 10 from the top, *for* "ague colic," *read* "ague-cake."
,, 641, line 13 from the bottom, *for* "admission," *read* "admiration."
,, 649, line 22 from the top, *for* "effusion," *read* "affusion."